The Mining Journal

Established 1835 — Railway & Commercial Gazette

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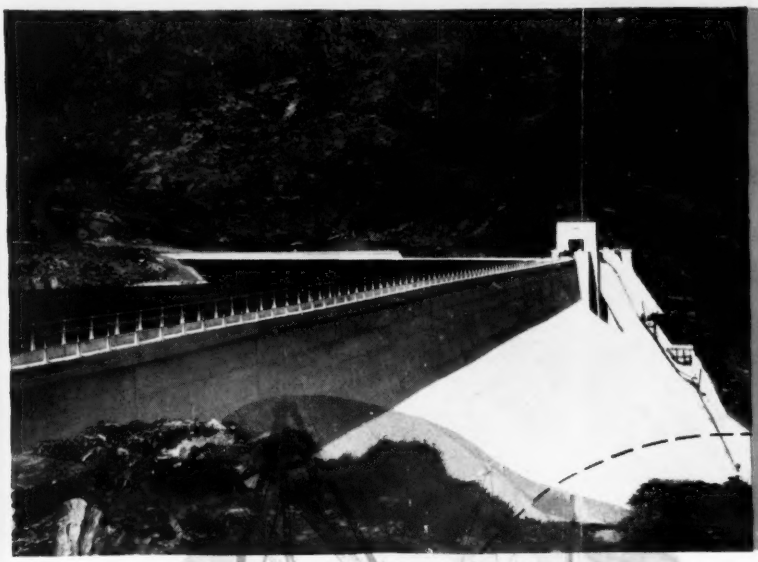

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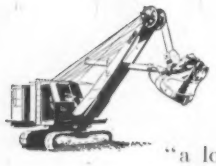

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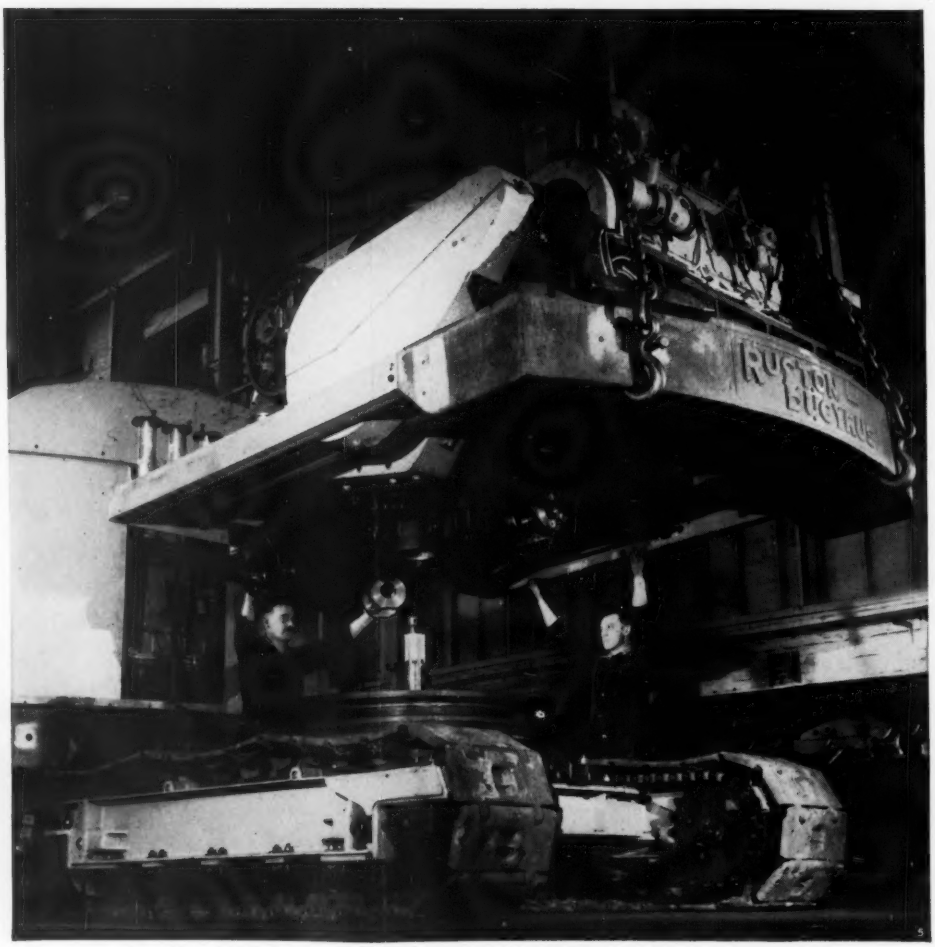

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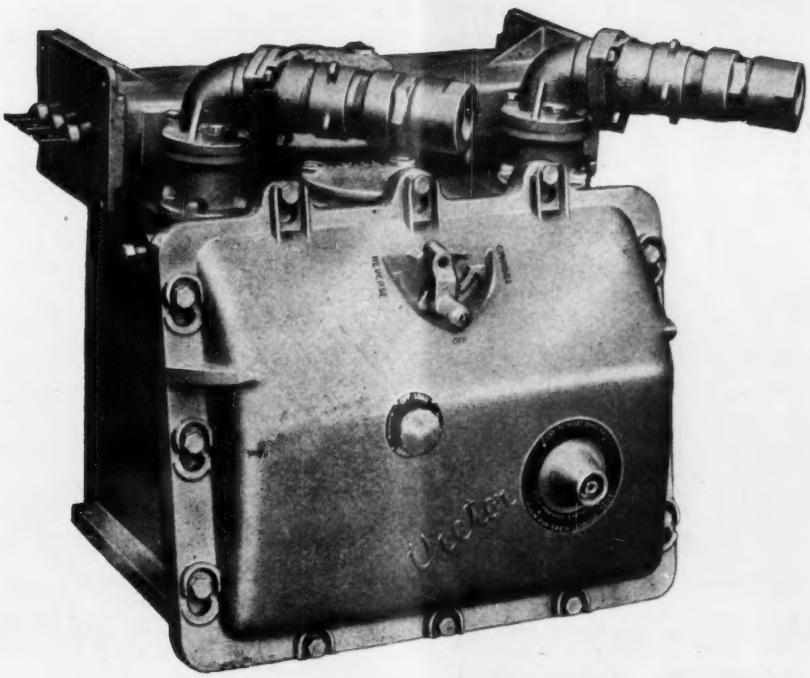

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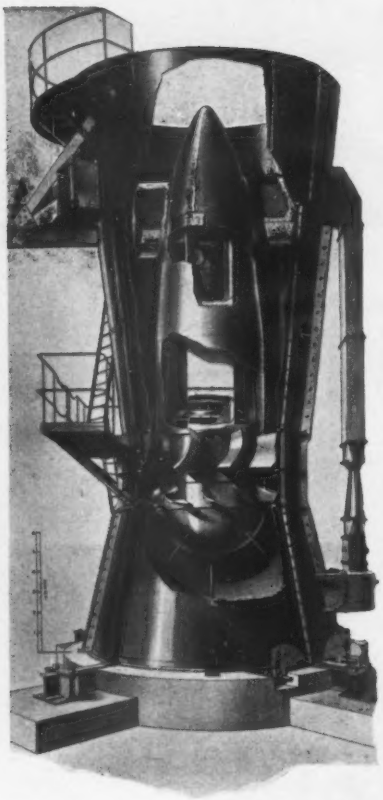

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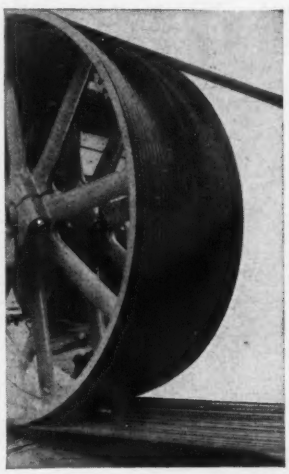

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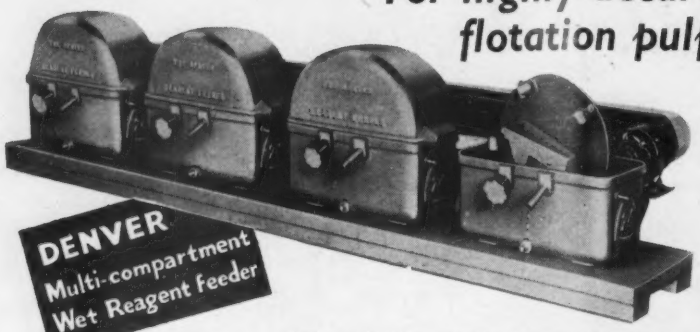

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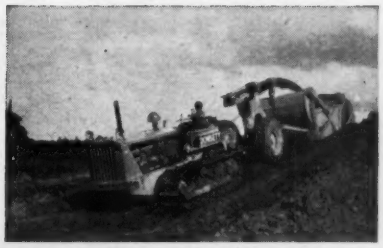
The British 'Challenger' now a world contender



Hauling a 13-yard scraper this Challenger 4 is filling in the worked out Esswood open cast coal site at Essington in Staffordshire.

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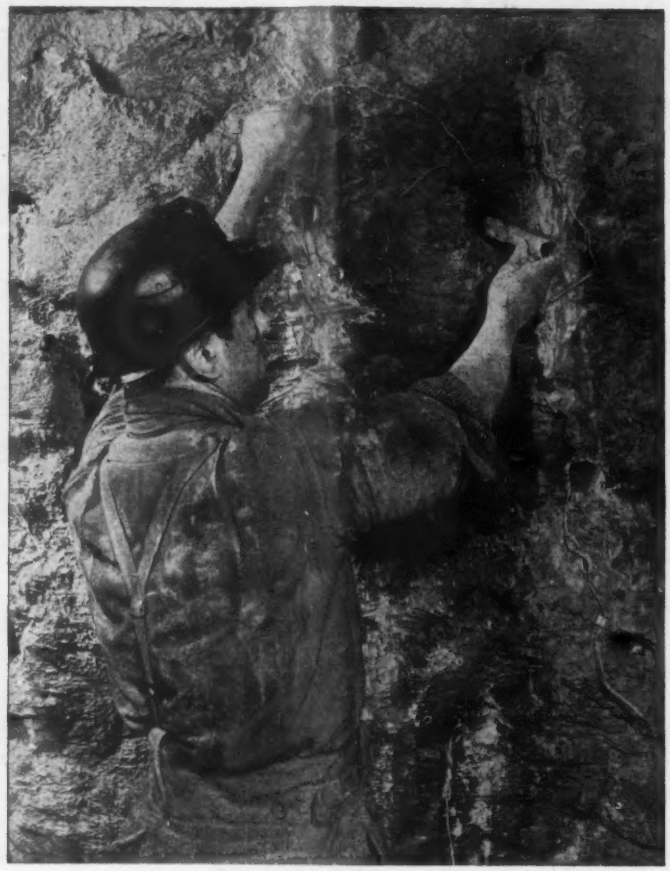

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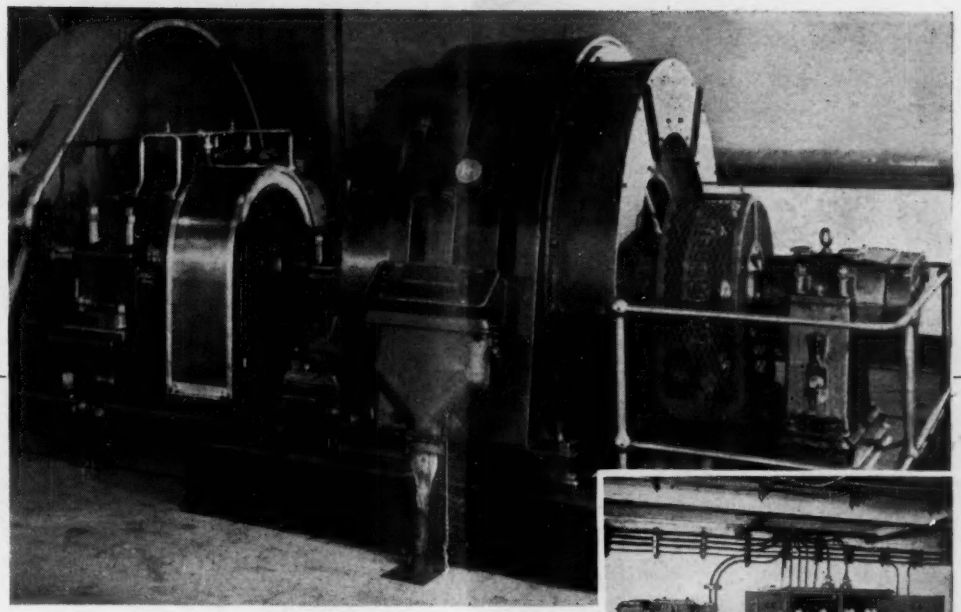

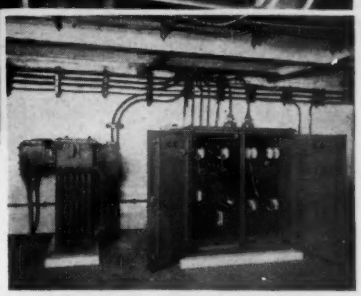

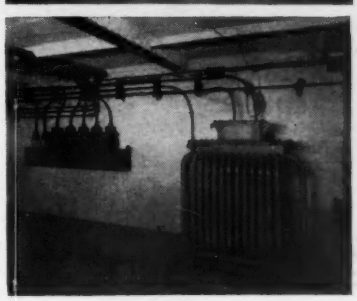

Positive, smooth and accurate control is essential for the safe riding of men. The conveyance of material and equipment is also of major importance. Three methods of braking are available — mechanical, counter-current and D.C. dynamic. Mechanical and counter-current braking do not completely meet all the above requirements. The 'ENGLISH ELECTRIC' system of automatically compensated D.C. dynamic braking does ensure complete reliability. The system is particularly economic as the bulk of the excitation power is obtained from the conversion of the kinetic energy of the hoist leaving only a small balance to be obtained from the supply. Existing A.C. hoists can be modified to incorporate D.C. dynamic braking by the addition of 'ENGLISH ELECTRIC' static equipment.

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MEW.8

Rover Car Factory, Solihull. High intensity lighting in a body spray tunnel by fluorescent lamps in a glazed enclosure.

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Fluorescent lighting is as good as daylight — only more consistent. It is efficient; it is economical; and it is *flexible*. You can ' tailor ' it, easily and exactly, to the special requirements of production at all stages.

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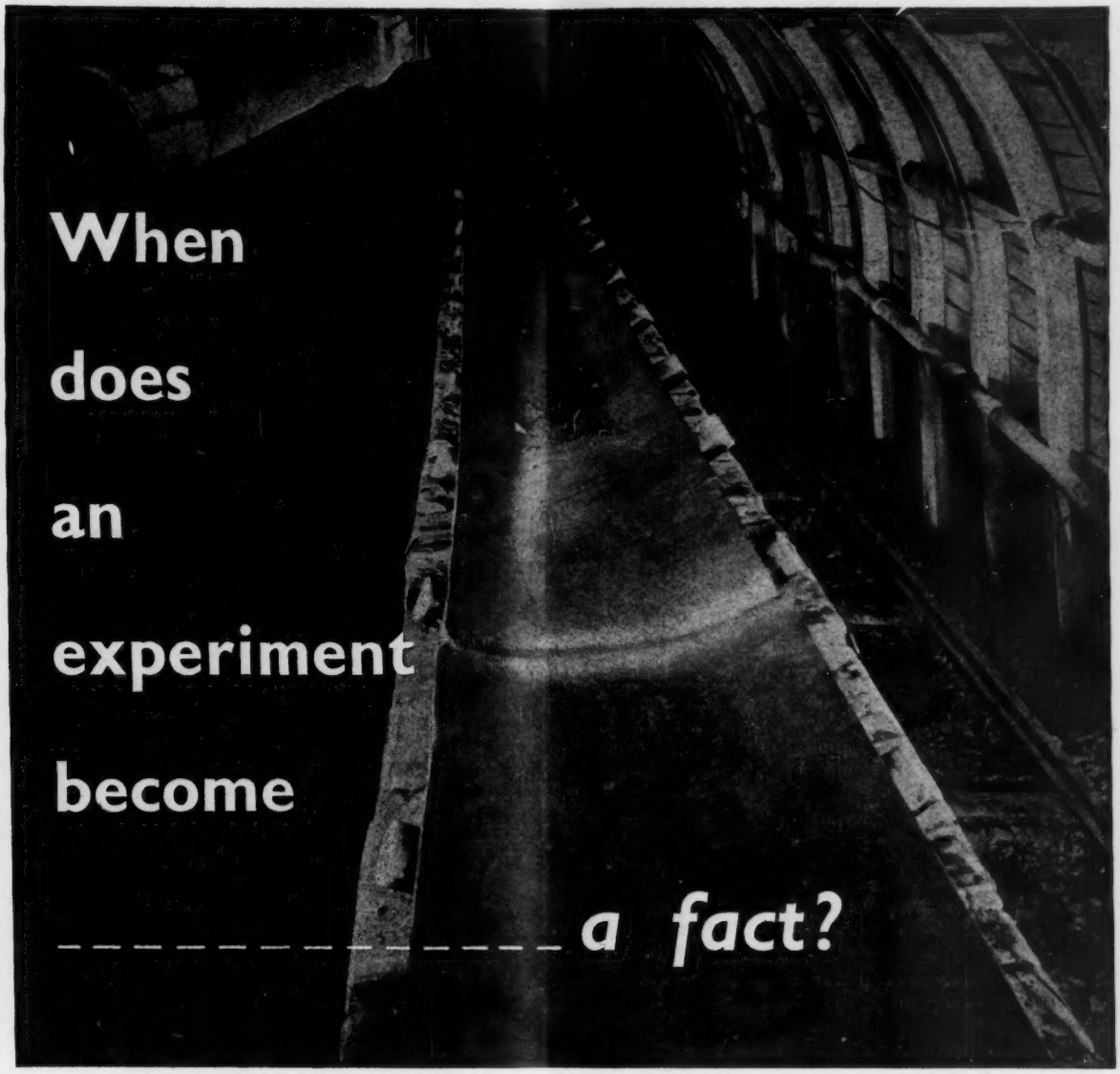
Issued by the British Electrical Development Association



There's a lot of talk these days about the experimental use of P.V.C. coated belting in Britain's Coal Mines. As the originators of this type of belting we ought to point out that our "SCANDURA" conveyor belting was first installed at Manvers Main Colliery in 1948. All the experimental work had been done before that.

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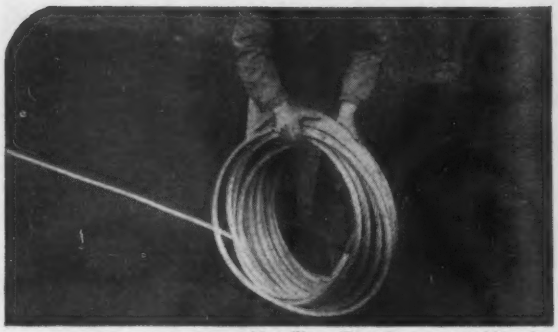
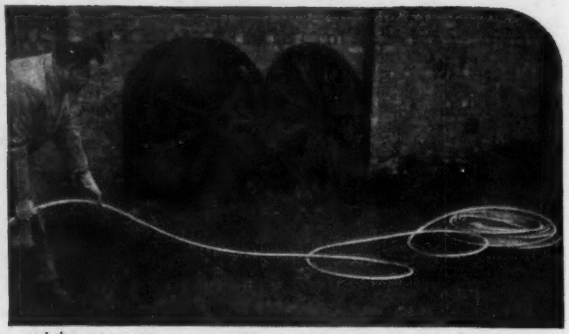
IF ROPE COULD TALK . . .

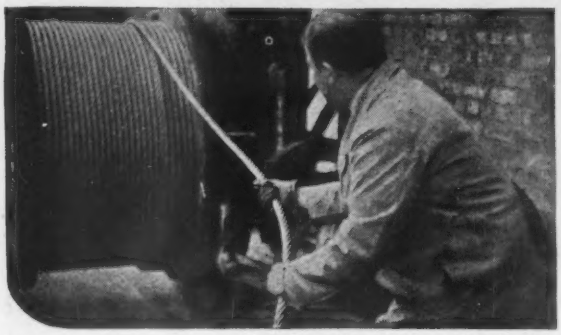
"I'm mighty like a hose!"



Uncoiling. The right way, treated like a hose



—and the wrong way



Unreeling. The right way, reel rotating freely

—and the wrong way

Good rope repays care in handling. Never allow kinks to form when UNCOILING or UNREELING a steel wire rope. Treat it like a hose pipe. A light coil of rope may be unrolled along the ground but should always be kept under control. A reel may be placed on a turn-table or mounted on stands and supported by a bar or tube through the hole in its centre. In no case should a coil or reel be laid on the ground and the end taken over; kinks will inevitably form and the rope's life and efficiency be seriously reduced. When COILING down a rope always put in under-turns as required to counteract the tendency of the rope to twist itself. Under-turning is simple—the rope itself will indicate that.

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The Mining Journal

Established 1835

Vol. CCXLII No. 6184 **LONDON, FEBRUARY 26, 1954** **PRICE 8d**

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NOTES AND COMMENTS

Trade Liberalization and the American Mining Industry

An intense effort is being made by the Republican caucas to resist liberalization of U.S. policy in regard to foreign trade in correspondence with its changed position as the world's creditor nation. Though on a far greater scale the conflicts are reminiscent of the resistance in Britain in the early forties of the last century to the adoption of the principle of free trade.

Then, as in the U.S. to-day, the ruin of the domestic mining industry was proclaimed as the inevitable consequence of the removal of import duties, and to some extent, especially with copper, the contention was justified; though in the light of the rapid expansion of production in Australia, Chile and the U.S.A. the result was inevitable. However, there can be no doubt that the British economy was enormously strengthened by free trade, and it is only natural that economic opinion in this country should believe that now, when America has become the world's creditor, the adoption of similar trade liberalization policy would prove no less beneficial to the U.S.

However, the vast influence of the mining interest, especially in the Western States, constitutes a formidable obstacle to any such innovation, at any rate so far as the mineral industry is concerned, and there is a tendency to represent trade liberalization as one of the mischievous fruits of the Democratic Party's 20 years of monopoly of power, of which the Paley Report is regarded as the final expression.

Naturally the Protectionist attack has been trained particularly on the troubles of the lead and zinc miners, especially the latter. Here we may detect several different points of view, or at least of emphasis. These are the tariff whole hoggers, who insist that it is the doubling of imports of foreign material—metal and concentrates—last year which has run prices down to the uneconomic level of 9.25 c. per lb., and caused a big reduction in the output from domestic mines, to correct which higher duties, State subsidies, quotas, or even embargoes are severally or collectively demanded. Others, like Mr. C. R. Ince, of the St. Joseph Lead Company, hold that world over-production has been the fundamental cause of the trouble and that, with the zinc price now far below the general commodity level price, there is room for considerable levelling up to take place, especially with U.S. consumption estimated at 985,000 s.tons last year as compared with the previous record consumption figure of 967,000 s.tons in 1950. Moreover the low price of the metal is an insurance against substitution, especially aluminium, with the present price of 9.25 c. for the higher metal.

Another angle of approach was suggested recently by Mr. R. G. Kenly, in charge of the Sales Department of the New Jersey Zinc Co., who said that while U.S. consumption of zinc had in years past shown a steady increase, the use of the metal was always under attack from substitutes, sometimes winning and sometimes losing ground, and that they could not afford to relax their efforts to sell zinc and fall into complacency, but that every producer must redouble his efforts to drive home to the American people the advantages offered by this useful metal.

The next stage in the controversy would seem to be the report of the Tariff Commission, due on or before the end of June, but it must be remembered that the question has now become even more political than economic and that it is by no means certain yet that the slender Republican majority in Congress will survive the November mid-term elections.

East-West Trade: A Vital Issue in 1954

That East-West trade will be one of the crucial issues of 1954 now seems to be beyond all reasonable doubt. Nor is this statement vitiated by the improbability of the Board of Trade sanctioning export licences for more than half the goods the Soviet Minister for Foreign Trade presented in a list to the party of British businessmen in Moscow about two weeks ago. While the £400,000,000 trading offer to Britain has been the largest salvo yet fired by the U.S.S.R. in her current trading offensive, it is by no means the only overture that has been made to non-Communist countries.

In fact, the U.S.S.R. has recently signed a dozen or more trading agreements with non-Communist countries, including Sweden, France, Italy, Belgium, Argentina and New Zealand. The form of the agreements, no less than their

content, has shown wide variation. But for all that, these agreements raise the same vexed question: how is Russia to pay for these imports?

While the 1953 trade figures for U.K.-Soviet trade show that Russia achieved a trading balance of approximately £24,000,000, this surplus can hardly be described as substantial when taken in conjunction with the recent Soviet offers to increase the volume and value of her imports.

Coarse grains and timber have been the Soviet Union's traditional export commodities, but neither of these has provided consistent earnings of foreign exchange and there is evidence to support the contention that agricultural exports are likely to decline in the immediate future rather than expand. A perusal of some of the trading agreements concluded with other non-Communist countries provides a part of the answer.

For example, Russian iron and oil is now arriving in Argentina in exchange for Argentine meat, butter and hides; films will be sent to Italy in exchange for cotton; timber, petrol and passenger cars to Belgium against imports of lead, cranes and ships. But even so these exports would account for only a small part of the capital needed to pay for her new import bill if, in fact, these goods were acceptable imports by other non-Communist countries with whom Russia apparently desires to expand trade.

Thus, it would appear probable that there will be a continuation, indeed, an expansion, of the flow of ferrous, non-ferrous and precious metals from Russia, as the means by which she hopes to pay for her imports. Whether or not this assessment of the position is correct, there has been no slackening of the U.S.S.R.'s sales of chrome, manganese, asbestos, iron, oil, silver, platinum and gold and the remaining question is, should this flow continue, what effect will it have on the International Commodity markets.

In the first place, these offerings will complicate markets in which hitherto the trading pattern was comparatively clear. Secondly, prices are likely to be depressed; the decline depending on the volume, frequency, confidence in continued deliveries, and the competition engendered by her entry into the markets. On this point, however, there is room for controversy. In the past, the Soviet Union has shown little regard for price. But reports from British businessmen returning from Moscow indicate that the Soviet is now very price conscious and her improved buying methods apparent at the last Dominion's wool-sales tends to confirm this view. If so, this would support the feeling that Russia intends to come into the market on an appreciable scale, that is to say, it will be in her own interests not to drive down the prices of the metals she is selling thereby turning the terms of trade against herself. But whether she has the marketing skill to avoid this danger remains one of the outstanding questions yet to be answered.

On the other hand, Russia's gold reserves must be considered as being second only to those held by the United States, so that it would be far more to her advantage if she footed the greater part of her import bill by exporting gold rather than other precious, ferrous, or non-ferrous metals.

Belt Conveyor Articles Available in Booklet Form

On another page in this issue we publish the last of a series of seven articles dealing with the design and use of belt conveyors in mines.

In treating a subject of such magnitude in so short a space there have inevitably been some omissions, particularly in connection with the most recent types of belting and conveying structures now undergoing exhaustive tests. Treatment of the subject has necessarily been general throughout and some of the conclusions may stand in need of modification when applied to specific installations.

Nevertheless, we believe the series of articles will be of permanent value to all those working in mines who use, or contemplate using, conveyors as a form of coal and ore transportation.

More than that, we believe these articles will fill a gap which at present exists in the required reading of all mining students, and not least for those who are sitting for the Mining Qualifications Board and Mine Institution examinations. Indeed, aside from a standard American work on the subject, we know of no textbook in English dealing with conveyor belts in mines in anything approaching so comprehensive and authoritative a manner, and it is significant that in recent examinations candidates have shown notable weakness in answering questions relating to this subject.

In response to numerous enquiries received alike from mining officials, academic institutions and manufacturers, we intend to re-publish the series in booklet form at an early date.

The Belgian Congo

(From Our Own Correspondent)

Brussels, February 13.

The pitchblende deposit owned and operated by Union Minière du Haut-Katanga at Shinkolobwe in Katanga, is referred to in *Minerals Yearbook, 1950* published by the U.S. Bureau of Mines, as "the world's largest producer of high grade uranium and one of the main sources of uranium metal used by the United States." The grade has been disclosed in *Strategic Minerals* as averaging 50 per cent U_3O_8 in comparison with 1 to 5 per cent for the American carnotite ores. In point of fact only some of the Shinkolobwe veins are of such high grade, although the overall deposits are certainly very rich.

Prior to the agreement of 1944 which gave the United States and United Kingdom exclusive rights to the Shinkolobwe pitchblende, Mr. E. Sengier, then managing director of Union Minière, had in 1940 shipped more than 1,000 tons of ore rich in pitchblende to the United States to prevent these ores from falling into enemy hands. The State Department was secretly informed of this action.

In its recently issued annual report the Belgian banking house Société Generale de Belgique discreetly stated: "The industrial use of atomic energy is actively pursued in Belgium and in the Congo. These areas owe it to themselves to make the most beneficial use of their fissionable materials and the competence of their technicians."

Recently in the Belgian Chamber of Representatives, Mr. van Zeeland, foreign minister, pointed out that the uranium agreement was not one which concerned the governments of the United States and the United Kingdom together with Union Minière du Haut Katanga, but was an agreement reached between the governments of the United States, the United Kingdom and Belgium. Following the cessation of hostilities Belgium had contacted the other signatories as early as 1948 in order to improve the counterpart of the agreement, and negotiations for full Belgian participation were continuing with appreciable results. It is interesting to recall that a centre for the study of the applications of nuclear energy has been established in Belgium, while the construction of a reactor will commence in April of this year at Moll-Donck, some 52 kilometres east of Antwerp. Research is financed by uranium sales.

BELT CONVEYORS—VII

General Considerations of Belt Conveying

By A. GRIERSON, B.Sc., A.M.I.Min.E.

The following article is the final instalment of the series published on belt conveyors, in which the fundamental principles and mechanical features of this method of transportation have been presented. General considerations of belt conveying logically include such factors as costs, subsidiary hoisting, surface transportation and safety, and these closing remarks briefly discuss these features while at the same time the basic operating principle of the cable belt conveyor is given detailed mention. ***The Mining Journal* has reserved world copyright on this series which may not be published either in part or in whole, without the express permission of the publishers.**

It has been the object of this series to present an outline of the fundamental principles and mechanical features of belt conveying. Only brief mention has been made of the factors to be considered before deciding on the suitability or otherwise of this system of haulage in any proposed installation.

Foremost amongst these considerations is the cost factor. Belt conveyors are expensive, and in order that the expense of installing and maintaining a belt conveyor system be justified, it is essential that the extremely high potential capacity of this type of haulage be fully utilized. Only when dealing with large outputs can belt conveyors compete favourably with those systems of primary haulage capable

Slusher loading onto belt conveyor in a gypsum mine

of intermittent delivery and greater mobility. With belt conveying the cost per ton mile decreases appreciably with increase in length of haul ; this can in part be explained by the fact that labour costs — frequently the most costly single item in any system of transport — do not rise significantly with increase in belt length. One of the principal objections to belt conveyors is the high initial and depreciation cost of the belting and so in order to make belt conveying an economic proposition the maximum possible tonnage should be handled.

THE TREND TOWARDS CONVEYORS

Whilst geological conditions and the consequent methods of mineral extraction generally render coal mines a more fertile field of application for belt conveyor systems, the use of underground conveyors on a large scale is by no means limited to collieries. Several metal and non-metal mines have of recent years turned towards this system of haulage as is evidenced by the following examples :

In a Chilean copper mine a 60 in. wide belt conveyor transports 5,500 tons per hour of crushed ½ in. ore a distance of 1,412 ft. and is still in operation after carrying 100,000,000 tons of material. Another copper mine in South America uses a 60 in. belt to move 3,500 tons of 12 in. ore per hour, whilst in Rhodesia a 7,000 ft. system of conveyors is giving every satisfaction.

Belt conveying is well suited as an adjunct to the block caving system of extraction, as the high capacity of this transport medium ensures a rapid withdrawal of the ore with the minimum labour requirements. At the Miami Copper Company's mine in Arizona the installation of a conveyor belt in a sub-drift under the grizzly level has lowered the timber repair cost because of the decreased time required to draw a block of ore. In one instance a block was withdrawn in 11 months as opposed to the 18 months estimated if track haulage had been used.

The installation of comparatively short belt conveyors as an alternative to tramming is becoming more popular. These are not meant to take the place of the principal haulage system, but merely function as small gathering units. The iron ore mines in the Lake Superior region have several installations of this type. At the New Helen siderite mine an underground 30 in. belt conveyor system 2,740 ft. in length and of 450 tons per hour capacity was introduced in July, 1949. This raises ore from the crusher level at elevation 670 ft. to the surface at 1,450 ft. operating on an inclination of 18°.

SUBSIDIARY HOISTING

Such inclined belts find useful application as a means of raising material from a lower horizon to the main hoisting level. An interesting installation was at the Sullivan Mine, Kimberley, B.C. Here, due to an unexpected increase in output from a section of the ore body below the 3,900 ft. level, the management was faced with the problem of choosing between the sinking of a new vertical shaft or an inclined belt conveyor. Factors which influenced the selection of the latter were :

(1) The cost of the conveyor installation was estimated to be about half the cost of sinking and equipping a shaft of equivalent capacity ;

(2) personnel requirements were lower ;

(3) H.P. requirements for the proposed shaft were estimated at 1,800 h.p. peak load as opposed to 480 h.p. for the conveyor system ; and

(4) subsequent extension of the conveyor, if required, could be carried out more easily than a shaft could be deepened.

The system as installed consisted of six 36 in. wide belts having a capacity of 400 tons of ore per hour. The total length of the inclined drift was approximately 2,500 ft. and the average gradient 16° 42′. Each of the conveyors was powered by a 100 h.p. induction motor at 550 volts. The six motors were started by one master control button and electrical interlocking ensured that they started in correct sequence and that full belt protection was obtained. In order to take full advantage of belt capacity, uniform feeding was essential ; this was achieved by crushing the ore underground and storing it in a transfer raise and subsequently feeding it through a compressed air operated drop door on to the receiving conveyor by way of a vibrating

feeder. By regulating the current to the feeder the flow of ore from the raise to the lowest belt in the system was uniformly maintained.

It is extremely difficult to give fair comparisons of the cost of different forms of haulage, as to do this would require an analysis of costs of installations operating under identical conditions. However, in an iron ore mine producing 500,000 tons of ore annually the transport costs for belt conveying showed a saving of 28/2d per 1,000 tons hauled, compared to the pre-existing track haulage.

INCLINED CONVEYORS IN SHALLOW MINES

Many new mines where the deposits are not too deep, are turning towards inclines to the surface and belt conveying, in preference to shafts equipped with skips or cages. It is in such cases that belt conveying finds its best application as it is by far the best medium for the elevation of large quantities of bulk material. With the introduction of stronger belts for conventional conveyors and the successful innovation of the cable belt conveyor, elevating of bulk material does not offer the limitations of the earlier belt conveyors.

The cable belt is essentially a heavy duty long distance belt conveyor in which steel wire ropes or cables are utilized to take the stress normally taken by the belting. This latter carries only the load. The basic principle is not new but the recent cable belt conveyors installed at Frances Colliery, in Fifeshire, and other mines embody a new conception of design. At Frances Colliery the cable belt conveyor displaced three orthodox conveyors operating in series over a combined distance of 760 yd. on an adverse gradient of 1 : 4. In the first year of operation the conveyor carried over 250,000 tons of coal.

The basic principle of the cable belt conveyor is that the carrying belt of single ply 32 oz. cotton duck fabric runs between two steel ropes. This belt has moulded into its construction spring steel straps at approximately 2 ft. 6 in. centres, extending across the belt and projecting for a few inches on either side. A carrying shoe is fitted at each end of the strap. The shoes have rubber inserts top and bottom, the entire shoe sitting on the steel cable thus supporting the belt between the cables. A load placed upon the belt causes it to assume a troughed shape, the weight of the belt and the material being taken by the cables. Under working conditions it has been shown that the grip of the shoes on the ropes is sufficient to prevent any movement of the belt relative to the rope. Although the grip of the shoe is strong it is not harsh, the rope nestling snugly into the shoe insert. As no slip occurs between shoe and rope, the belt and the ropes travel as an integral unit.

The ropes are driven by two Koepe driving pulleys mounted on separate half shafts coupled together by differential gearing, such a drive ensuring that the two separate ropes are driven at exactly the same speed under all conditions of loading. The differential also compensates for any variation in the diameter of the driving pulleys due to wear.

A longitudinal section along the conveyor is shown in the illustration and the rubber belt is constrained to revolve about the two terminal drums. The rope after leaving the driving pulley D picks up the carrying shoe at the point indicated, thus supporting the belt along the length of the conveyor up to the tail end belt drum. At this point the rope continues along towards the rope tail pulley A whilst the shoe, which in effect becomes inverted, continues round with the belt and re-engages immediately with the rope returning from skew pulley B. This simple and ingenious transfer arrangement is repeated at the discharge point. Pulleys B and C are slightly skewed to allow free passing of ropes.

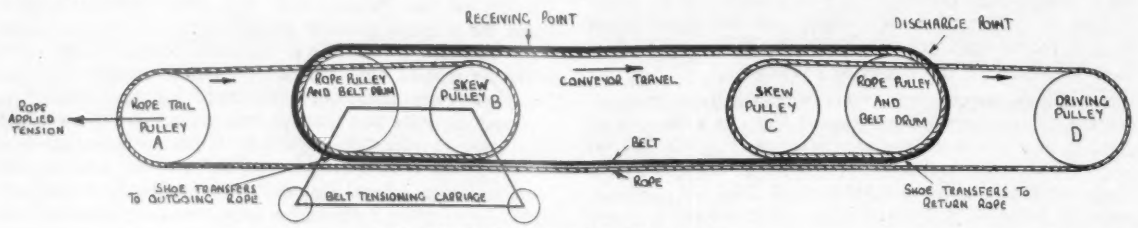
The cables are supported along the length of the conveyor run by ball bearing pulleys set at 4 to 9 yd. centres, the intervening distance betwen pulleys being governed by conditions of operation. As the belt itself does not run over idlers as in an orthodox conveyor, belt sag between idlers is eliminated. Thus there is no power wasted in the continual lifting of the load from the troughs between idlers, resulting in a substantial reduction in h.p. to drive the conveyor. In addition, the belting is not subject to the heavy deterioration caused by continual flexing under stress. A further advantage lies in the fact that only at the terminal drums is the carrying belt in contact with any surface, this resulting in the elimination of abrasion of belt by friction.

Belt tensioning can be effected independent of rope tension by use of the tensioning carriage. Movement of this carriage will have no bearing whatever on the tension existing in the ropes. The capacity of the cable belt conveyor is rather greater for equal width of belt, this being attributable to the complete lack of jolting of material while on the belt. Consequently the belt may be more fully loaded. The maximum angle against which material can be conveyed may be increased beyond the angle of repose of material on the belt, as due to the fact that at no time is the carrying surface of the belt in contact with the conveyor structure, slatted bars may be placed transversely across belt and so effectively prevent material rolling back.

The National Coal Board has ordered cable belt conveyors for a number of mines: the conveyor to be installed at the Argyll Colliery, Machrihanish, Argyllshire, will have a vertical lift of 1,080 ft. in a distance of 6,000 ft. This will constitute the highest lift of any single belt conveyor in the world so far as is known. If orthodox belt coveyors had been employed under these conditions series operation would have been required, this requiring in the interests of safety a belt attendant at each discharge point.

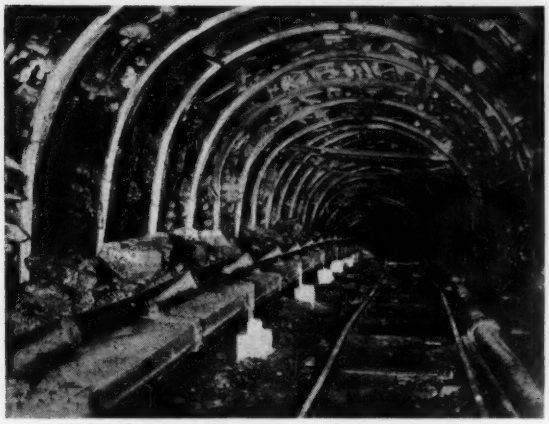
MECHANICAL CONSIDERATIONS

In mining practice one of the principal objections to a belt conveying lay-out is the fact that this system is essentially uni-directional. This immediately raises the problem of maintaining an adequate supply service of materials to the working places in the mine. This usually necessitates a separate supply system with consequent added expenditure for although belt reversal on short conveyors is frequently used, this method necessitates absolute alignment of conveyor. Mechanical considerations preclude successful belt reversal on long conveyors and, even if this were practicable, the reversal of belt conveyors to carry supplies into the mine would be confined to single flight systems, as otherwise



A longitudinal section along the conveyor

the material would be required to be transferred by hand at each tripper or terminal drum. In mines where the working places are far from the shaft the transport of men to and from the face usually requires a separate transport system.



Underground conveyor with supply track

In the Netherlands, however, man riding on conveyors is permissible if the prior approval of the Inspectorate has been obtained. Certain requirements are necessary before approval is given, chief of these being as follows : There must be 3 ft. 4 in. clearance above the belt at stepping off stations, 16 in. being the minimum clearance elsewhere, and belt speed must not exceed 295 ft. per min. Stepping off stations are to be 33 ft. long and a similar distance from the end of the belt. A sufficiently wide path must be maintained alongside the belt and men must not be spaced closer than 9 ft. 10 in. when on the belt. An effective signalling system must also be maintained along the conveyor run.

Occasionally, conveyors are designed to carry the load on the bottom strand of the belt. If this type of conveyor be used, materials can be taken in on the upper strand, but as with belt reversal, the usefulness would be confined to single flight conveyor systems.

SURFACE TRANSPORTATION

Large scale transportation of material on the surface is well suited for belt conveying and several big civil engineering schemes have demonstrated the fact that if high tonnages are contemplated, length of haul need offer no unsurmountable problem. The Bull Shoals Dam and the Shasta Dam projects in the U.S.A. give striking illustrations of the application of bulk movement on the surface. In the former project 4,000,000 tons of crushed 8 in. dolomite was transported a distance of 7 miles over undulating country at a cost of 4.5 c. per ton-mile. A total of 21 conveyors were used in this scheme and only 7 workers were required to operate the entire haulage system. The belts carried 650 tons per hour at a speed of 525 ft. per min. The Shasta Dam installation in 1940 required the conveying of 7,600,000 tons of gravel and 2,800,000 tons of sand over a distance of 9.5 miles. The system consisted of twenty-six 36 in. wide belts operating at 555 ft. per min. and carrying 1,100 tons per hour. With one exception — the final conveyor — all belts were powered by a 200 h.p. motor. Individual belt lengths ranged from 850 ft. to 3,400 ft.

A spectacular installation is contemplated at the present time, involving the movement of material 103 miles across country between the shores of Lake Erie and the town of Midland on the River Ohio in Pennsylvania. This will involve a two-way conveyor system, ore from Lake Erie being carried south and coal from the rich Pittsburgh field travelling north. It is estimated that this transport system when carrying coal will result in a saving of 7/6 per ton over rail freight charges when handling an output of 15,000,000 tons per annum. This saving will increase to 10/- per ton on an output of 20,000,000 tons. The corresponding saving in transport costs when dealing with ore is 4/- per ton on an annual capacity of 32,000,000 tons. The installation will consist of 172 orthodox belt conveyors of 72 in. width travelling at 600 ft. per min. The estimated saving in haulage costs forcibly bring home the possibilities of large scale conveying.

Belt conveyors frequently are an indispensable part of many surface mining and mineral dressing plants. An interesting example of belt conveyors in an opencast tin mine is to be found at Hong Fatt (Sungei Besi) Ltd., reputedly the largest opencast tin mine in the world. Following the re-organization of the mine after the Japanese occupation it was decided that the pre-war practice of transporting the karang by inclined rope haulage be superseded by belt conveyors. Accordingly in 1949 an 1,810 ft. long conveyor system started operating on a 1 : 4 incline up the side of the excavation. In this operation the karang, or tin ore bearing alluvium, is mined on the bench system, the ore being carried from the working places to the foot of the conveyor. The installation resulted in a considerable reduction in costs as it released several haulage workers for other duties in the mine. This saving in manpower is an important consideration where labour is not readily available. At one large colliery in Britain where belt conveying replaced endless rope haulage, a total saving of twenty-one manshifts per day resulted.

From the all-important safety aspect, belt conveying compares favourably with any other form of transport when considering haulage accident frequency. If, as seems highly probable, the fire hazard can be eliminated by use of non-inflammable belting, the accident frequency can be maintained at a low figure. Statistics issued by the British Ministry of Fuel and Power show that for the three years

The belt conveyor, 1,810 ft. long, at Hong Fatt

up to and including 1951, forty-four fatal accidents were attributable to conveyor haulage — face and roadway — as compared to 245 fatalities with tub haulage. Bearing in mind that conveyors carry 90 per cent of the output from British mines at some stage or other the figures show that this system of haulage is conducive to greater safety.

SUB-LEVEL CAVING—II

Attendant Problems to Sub-level Caving at Grängesberg, Sweden

By B. K. LUNDIN

In our issue of February 19, 1954, the first portion of this article by the underground manager at Grängesberg discussed the development and current practice of mechanical sub-level caving at Grängesberg, Sweden. In the concluding remarks which appear below, relevant factors to the method are discussed. These present a wide variety of considerations, including geological conditions, technical data of mining methods and machinery maintenance, as well as factors of economical operation.

Many of the vital problems connected with sub-level caving are closely dependent upon the existing geological conditions. Among the questions involved are the slice height, drift size and pillar thickness, as well as the loss of ore and the ore percentage. These problems have been the subject of deep consideration at Grängesberg.

In reference to the geology of the Exportfältet, it should first be observed that in this case it is not a matter of an accumulated or a homogeneous nature. The main ore essentially consists of four interlocking ore bodies having the same longitudinal direction, with the width of the ore body varying from a few metres to 95 m. The total length between the extreme points is 1,500 m. The same deposit includes a parallel ore body named the Timmergruvan, which also varies considerably in width and has a length of 500 m. All the ores are apatite iron ores consisting of black iron ore or bloodstone of a high phosphorous content, varying from 0.8 up to 8 per cent P, on an average 1 per cent. The surrounding rock is leptite throughout. The side dip ranges from 65-70 deg., and the field dip is about the same. The ores are traversed by series of younger strata of various kinds, partly pegmatites without any regularity whatever and of varying thicknesses, partly of amphibelites and leptites more or less regular but of varying width. In addition, chlorited slips are quite frequent.

ORE AND GRANITE DEPOSITS

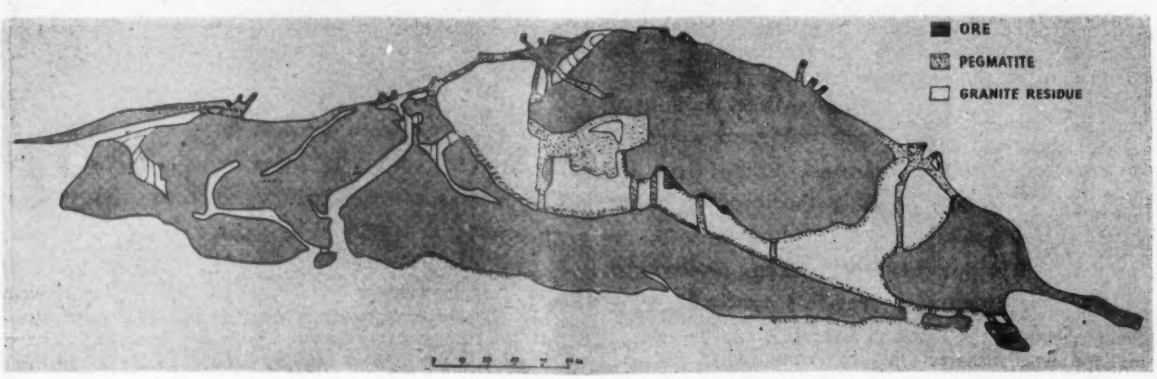
Except for those mentioned, the geological nature of the veins is of no interest from the point of view of mining technique, therefore the references which follow concern only ore and granite. Disregarding the granites which are not included in working operations, the actual ore area is 65,000 sq. m. Earlier the ore area between the footwall and the hanging wall was estimated at 80,000 sq. m., indicating that nearly 20 per cent of the ore consists of substantial granite deposits. The slice with floor last broken is located in the Karl Johan area of the main ore 255 m. below the surface. The large granite deposits left there comprise 5,350 sq. m. of the total area of 21,600 sq. m. between the footwall and the hanging wall, that is, 24.8 per cent of the whole.

Drifting operations are essentially carried on from cross cuts directed from hanging wall to footwall under present arrangements. Only in the footwall drift and in some narrow bodies is the ore still broken along the strike. When working transversely, the hanging wall pressure can be fully utilized. Furthermore, the natural fall of the broken ore against the footwall facilitates a more complete extraction, as there can be no jamming or catching on footwalls. In the case of longitudinal granite veins which follow the general dip, some drilling and loading of granite will be necessary to make it possible to reach the superincumbent ore, but on the other hand the ore will be completely extracted. In order not to break the uniformity of the system, it is necessary to carry on the drifting regardless of the granite veins which also involves a reduction in the ore percentage. A deviation from the general drifting plan is only made in large or fairly regular granite formations, the position of which can be fairly safely determined in advance.

ORE PERCENTAGE

The ore losses when using the present method will be very small, perhaps 1 per cent, but this is partly attained at the expense of ore percentage. When the method was introduced a decline in the ore percentage by a few units was anticipated. It has proved possible to satisfactorily maintain this anticipation. In recent years, however, a rearrangement involving additional breaking of a more granite mixed portion of the ore (the Lönnfall area) has been necessary, to effect a more uniform sinking in the whole field, and this of course, reduces the ore percentage as compared with that previously appertaining. It is, of course, natural that the proportion between development drifting and mining influences the percentage ore and that comparisons between various years cannot simply be made purely by figures.

It will scarcely be possible to increase the size of drift



The Karl Johan ore, 255 m. below surface

appreciably without extensive reinforcement work being necessary. The strength of the ore is rather poor. Even in the case of the present width of drift, a careful scaling is important, and timbering is also often necessary. A slight increase of the bearing distance, for instance, where the drift branches clearly, shows that the drift width should not be much in excess of 2 m. These conditions will be still more marked as the depth increases and with it the rock pressure. New reinforcement methods may warrant a reconsideration of this idea.

The pillar thickness is immediately dependent on the slice height when the drift measurements are unchanged. An increase of the slice height has often been discussed, but the extremely good experience obtained from the height so far used has resulted in this being maintained.

TECHNICAL DATA

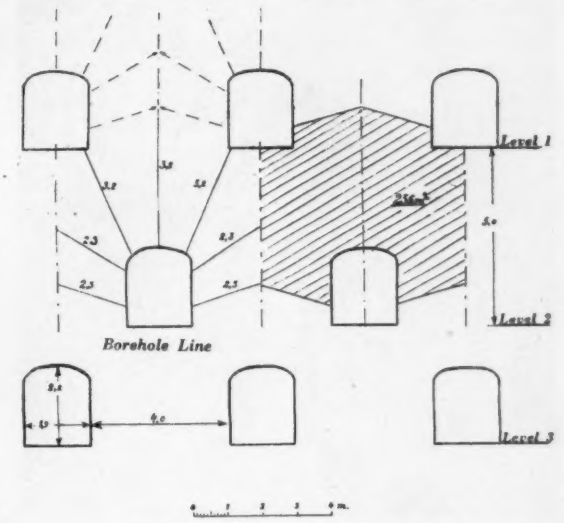
A statistical comparison of the distribution of the total quantity of rock removed by the various mining and handling methods prior to utilization of ore passes is shown in the table below. This table also gives technical data and outputs recorded in 1946, the first year when mechanical sub-level caving was statistically recorded, 1951 and 1952. In this connection it should be observed that in 1946 development work by the burn cut method had not yet been started.

The data of mechanical sub-level caving given in this table constitutes an average for the whole field, the thinner ores where mining is carried on along the strike, of course, involving a reduction in the outputs. A certain measure of this constitutes the piece-work price which in these areas is from 25 to 40 per cent higher than in ordinary cross-mining ores. The piece-work comprises drilling, charging, blasting, loading, breaking up and blasting of boulders, hand wagon transport, dumping in ore passes, trimming where necessary, moving of the drilling and loading equipment between the drifts, lubrication, simple machine attendance, and removal of rails as the withdrawal proceeds. The piece-work price also includes the explosive. The blasting along the hanging wall constitutes extra expenditure.

	1946	*1951*	*1952*
Tonnage ore extracted ...	1,161,440	2,501,330	2,622,700
Source of tonnage—	%	%	%
Chute caving (excl. drifting)	61.9	4.8	1.4
Mechanical sub-level caving	21.2	68.9	69.4
Shrinkage stoping	3.1	1.4	1.7
Breaking up boulders ...	—	5.3	5.8
Drifting, etc.	13.8	19.6	21.7
	100.0	100.0	100.0
Handling before ore passes—	%	%	%
Timber chutes	65.5	11.0	5.7
Mechanical loading ...	22.8	85.5	91.7
Hand loading	11.7	3.5	2.6
	100.0	100.0	100.0
For mechanical sub-level caving:			
tons per kg. of dyn. ...	11.5	12.9	12.8
,, ,, 8-hour shift ...	48.1	69.5	77.9
For development drifting:			
total meterage obtained ...	3,810	24,225	25,795
kg. of dyn. per drift-m. ...	9.1	10.8	10.7
drift-m. per 8-hour shift. (excl. loading)	0.96	1.49	1.57
Ore percentage in deposit ...	69.4	64.5	64.0
Consumption of timber in cu. ft. per 100 tons of ore ...	6.7	1.3	

The above table includes, however, the special piece-rates, that is, the jobs in conjunction with mining where each operation is paid separately. This mainly relates to drilling in the neighbourhood of the pegmatite veins. In 1951 the time for such special tasks amounted to 16 per cent of the total working time recorded during mechanical sub-level caving. In 1952 this figure was 20 per cent. As these jobs result in a small amount of rock extraction, it is obvious that from this point of view geological conditions have a depreciatory effect on the total output in sub-level caving. The statistics also indicate the results of the normal piece-rate. In December, 1952, the actual output in the transverse mining areas was 102.8 tons per man in eight hours.

The accompanying illustration shows a longitudinal section of a portion of ore comprising three slice levels. It should be observed that the holes shown are not entirely on this level due to the inclination angle. The total meterage per row will thus be: in the pillars 2 (2.3 + 2.3) and in the roof 3.2 + 3.8 + 3.2 = 19.4 m. The distance between the rows is 1 m. As the charging frequency is about 0.6 kg. of dynamite per metre drilled, the consumption of explosives per row will amount to 11.6 kg. The volume of ore which is reached from a cross cut is 25.6 m.³ per metre.



Longitudinal section of a portion of ore

Grängesberg ores, containing 58 per cent of Fe or 50 per cent of Fe, have a specific gravity of 4.5 and 4.1 respectively. Thus 115-105 tons of ore is theoretically obtained per cross cut metre at the specific gravities mentioned. The output will then be 9.9—9.1 tons of rock per kg. of explosive or 5.9—5.4 tons per metre drilled. When these figures and the conditions on the superincumbent broken slice level are recognized, the work can be more easily supervised so that there will be no unnecessary loading of rock fill. It should be observed that the figures mentioned are theoretical and, in spite of their apparent accuracy, only attain under ideal conditions.

MAINTENANCE AND REPAIRS

Rational utilization of the machines is conditional upon efficient upkeep and repair service. In respect of organization, the field is divided into four mine areas, each having its own supervisor. In each of these there is a repair workshop for rock drills, relevant equipment, and hoses. Here defects in the material are located and parts, such as packings, washers, bolts and springs are replaced. Should major repairs be necessary the material or units to be reconditioned are delivered to the surface works. Lubricating oils are also stored in the shops below ground and are supplied from there.

Loaders and mine cars are repaired locally, and thorough overhauls are only made in the works above ground. The loading machine repairers are present each working shift in

order to be at hand at all times, and the type of repairs handled by these workers will be clear from an enumeration of such damaged and worn parts as are replaced by them: wheels, wheel axles, couplings, pinions, balls and ball races, chains, gear boxes, vanes, traction and bucket operating motors, air controls, cradles, steel wire ropes, springs, side covers and buckets. If the upper part of the loader has to be raised, a cotter slot is made above the machine in the drift roof, and in this hole a hook with block is suspended. Special welders with portable units for electric and gas welding are available when necessary. At present, one repairer is maintained for 12 machines. Small stocks of spare parts are kept below ground.

To handle lubrication — for which the loader operators are not held responsible—two additional men are reserved

Atlas Diesel loader at work in sub-level caving operations

for the whole mine. They keep records for continuous lubrication, especially of the gear boxes and motors of all loaders, and when visiting the sites, assist the operators in making minor repairs and report any existing machine defects before these have become acute. Finally, four men are occupied in the mine with repair and lubrication of the end-dumping cars. The welders mentioned are members of the timbering personnel and are lent out when required. Most repairmen have attended short training courses in Atlas Diesel's works at Sickla, Stockholm.

An investigation covering the first six months of 1952 shows that cost of spare parts of Atlas loaders amounts to about 1d. per ton of loaded rock.

ECONOMIC CONSIDERATIONS

An idea of what the introduction of the mechanical sub-level caving method has meant from a narrow economic point of view is obtained when comparing the cost per ton of ore in sub-level caving including development drifting for chute caving and mechanical sub-level caving respectively. In the case of the former method, to balance any differences in the proportion between mining and drifting, a five-year period—1939-1943—is studied as the last years of actual chute caving. The year 1951 is chosen to represent mechanical sub-level caving. When using this method it may be estimated that a quantity of 110 tons of broken ore requires the excavation of 1 drift-m.—in itself this excavation gives 19 tons. The costs included in the comparison are in the case of chute caving: wages including foremanship and holidays, drill steels and drill steel sharpening, hoses, pipes and fittings, other drilling material and spare parts, rails, timber, lubricants, carbide and lamp care, explosives, other material, air, underground timbering, repair shops below and above ground, freight of materials and ore pass haulage on the haulage level. In the case of mechanical sub-level caving, costs included are those of tungsten carbide steels and grinding, wages for the repairers. Costs of spare parts for the loaders and amortization of these will be additional.

When comparing the average cost per ton in 1939-1943 thus obtained with the cost figure for 1951, it will be found that, if consideration is given to the decline in monetary value, the mechanization and rationalization carried through was well warranted from an economic point of view. This is accentuated again by the fact that substantial increases in wages took place simultaneously. The essentially increased outputs per manshift involve, of course, considerable savings in administrative and social expenses, as the same production can be maintained by fewer hands. In addition, the work has been highly facilitated.

TIME STUDIES

In conclusion, data from two time studies made at the turn of the year 1952 is presented. Two optionally chosen mechanical sub-level caving teams are representative, one in the Müller and the other in the Karl Johan areas. In both cases working in cross-cuts is involved.

	Müller		Karl Johan	
	Driller %	Loader %	Driller %	Loader %
Time for drilling				
Net drilling time ...	29.8	—	27.3	—
Other drilling time ...	8.3	—	11.9	—
Time for charging				
Blasting	1.1	0.8	1.2	—
Time for loading				
Mechanical loading				
Net time	10.1	34.8	12.6	30.7
Handling boulders ...	1.3	3.4	—	4.1
Outward transport dumping, inward transport	14.4	29.4	10.2	26.2
Scaling, lubrication, working the iron bar in falls	0.3	1.4	—	1.1
Rigging times	2.2	1.3	2.7	0.4
Operational times ...	12.5	10.7	12.1	11.3
Normal waste times ...	11.9	8.1	9.3	12.1
Personal waste times ...	4.9	3.8	7.8	10.1
Abnormal	3.2	6.3	4.9	4.0
	100.0	100.0	100.0	100.0
Shifts studied	2	2	1	2
Work done per shift:				
Number of holes ...	18	—	12	—
Meterage obtained ...	38.7	—	30.3	—
Tons loaded	38.8	148.2	45.1	110.7
Haulage, m.	65	59	63	61
Net drilling rate, mm./min.	271	—	231	—
Meterage per row ...	18.6	—	17.7	—
Kg. of dyn. per m. drilled	0.53	—	0.55	—
Burden m.	1.1	—	1.1	—

Tons per man and shifts assuming 2 loaders + 1 driller:

Müller: $\frac{2 \times 148.2 + 38.8}{3} = 11.7$ Karl Johan: $\frac{2 \times 110.7 + 45.1}{3} = 88.8$

The next problem at Grängesberg requiring a different solution to that accepted at present will be haulage from the slice levels, that is to replace hand wagon transport by some form of mechanized transport and, if possible, increase at the same time the quantity of rock broken per round. The most natural measure in this connection is to alter the slice height, when the drifting is also reduced, but this will no doubt involve both an increase in the intermixture of granite in the ore, and a greater loss of ore.

Provision of Metallic and Non-metallic Elements from Sea and Air

The practical possibilities of applying mineral engineering for the extraction of a wide range of metallic and non-metallic elements from sea water and air were discussed at the recent annual meeting of the American Association for the Advancement of Science by Professor A. M. Gaudin of the Massachusetts Institute of Technology. The following article presents a précis of his remarks, dealing with the extension of available supplies of phosphates and potash together with practical means of drawing upon inexhaustible ocean resources for commercial quantities of magnesium and bromine. The synthesizing of nitrate from the air provides a low grade of ore, but constant grade and limitless tonnage may be regarded as providing a rational basis of operation.

In recent years, to meet growing demands, guane, phosphate rock and certain by-products of metallurgical operations have provided an increasingly large portion of the available phosphates, the most important source being sedimentary phosphate rock formations.

The initial exploitation of mineral phosphate sources, using washing and screeening processes, was highly inefficient in terms of yield as compared with overall mineral content of the materials being worked. The subsequent development of flotation and agglomeration processes, bypassing specific gravity as the major factor of separation, substantially increased the amounts of phosphate obtainable from such sources.

The importance of the flotation and agglomeration processes lies in their depending for their effectiveness on causing the phosphate particles to stick to air while quartz does not stick, or conversely on having siliceous particles stick to air while the phosphate particles do not. In this way a suspension consisting of the sand-sized materials is separated into two parts, one of which forms either a froth or aerated agglomerates and the other a watery suspension of the usual type. The two parts, under the influence of gravity, follow different paths, one of them becoming the concentrate.

In addition to the phosphate that is being mined and of which a substantial part is now recovered, there are voluminous strata that contain the phosphate largely in the form of the slimy particles of micron size. These deposits are not exploited at present because of their unattractive character. As some contain somewhat more uranium than the very low content of the regular phosphate rock, it is likely that their exploitation as a joint uranium-phosphate combination will be realized.

TREATMENT OF POTASSIUM DEPOSITS

In connection with the treatment of ores containing potassium chloride with sodium chloride—the so-called sylvinite ores—the process takes simple form in that it involves heating the ore with brine to produce a hot brine saturated in regard to both potassium chloride and sodium chloride, separating this liquor from the common salt reject, cooling the brine to crystallize potassium chloride and filtering at low temperature to separate the potassium chloride crystals from the cold brine which is re-used with a new batch of ore. This heat-leaching and cooling-crystallization process rests upon the physico-chemical fact that a brine in contact with both potassium chloride and sodium chloride and saturated with both contains much more potassium when hot than cold, while it contains slightly less sodium when hot than cold.

Meanwhile, from the lead given by German scientists, American chemists developed a more economic process for treating New Mexico sylvinite ores, combining the advantages of flotation operation with those of crystallization. In this process the mixture of potassium chloride and sodium chloride is aerated as an aqueous slurry after appropriate organic compounds have been added to the pulp. This waterproofs one or the other of the salts, and the waterproofed particles stick to the bubbles to form a froth. By using relatively minute quantities of dodecyl or hexadecyl amine salts and starch, for example, it is possible to cause the potassium chloride particles alone to float attached to air bubbles in a brine saturated in respect to both potassium chloride and sodium chloride while the sodium chloride and the clay are maintained in the wetted state in the suspension. The process is not just a straight flotation process because of the solubility of the minerals and because of the variations in solubility with temperature, in fact, because of those attributes which made the German process possible before the invention of this flotation process. In the latest expression of the flotation process for the treatment of the New Mexico ores, the recovery of the valuable constituent is obtained in part through flotation and in part through a heat-leaching and cooling-crystallization cycle. The effects of the potash floating processes have been to lower the relative price of the potassium salts, to make possible the treatment of materials which formerly were ignored, and also to increase the demand for this cheaper potash.

Plans are under way to recover potassium from sea water This latter development uses still another novel process, invented in Norway, which includes as one of the steps the removal of the potassium from sea water by a selected ion-exchange resin. This ion-exchange resin would abstract potassium in exchange for sodium or hydrogen whereas at a later step, the resin would be regenerated by treatment with appropriate solutions of common salt or of acid.

In this way a cyclic operation would result with production of an enriched potassium brine as its direct aim. Thus, the prospect exists of extending the ore reserve of potassium to the entire mass of the ocean. Such an ore reserve would inevitably assure forever against a deficiency of potassium not only because it is so vast and so uniform in grade, but also because everything eventually returns to the sea.

ACCELERATION OF NATURAL PROCESSES

Magnesium is extracted by causing sea water to pass over calcined oystershells. The lime reacts with magnesium to produce a precipitate of magnesium hydroxide and places the calcium in solution. The magnesium hydroxide is then settled and filtered off, and from it metallic magnesium is made by electrolysis. Bromine is extracted by adding to sea water an organic compound containing chlorine, the process depending on the fact that the organic chlorine compound reacts with dissolved bromine in sea water to form the comparable organic bromine derivative while the chloride ion takes the place of the bromide ion in the water. The organic bromide compound is insoluble and is removed by filtration.

By the adaptation of processes for the removal of solutes, in particular by such processes as solvent extraction and ion exchange, it may be possible to draw on the sea for many elements other than bromine, iodine, magnesium or potassium. These four are just the beginning of what may become the longest list of mineral products yet to come from any one source.

THE INTERNATIONAL TIN AGREEMENT

The International Tin Agreement is open for signature by the participating Governments in London at any time within three months from next Monday. At this moment it is impossible to forecast whether the Agreement will be ratified or not. On purely economic grounds the consumer countries can have little to gain from ratification in the short term; on the other hand political considerations will inevitably play a major part in the decision of most Governments, and consumers may well feel that in the long run price levels may average out at much the same in either event. From the producers view point, however, the attraction of the Agreement must depend to some extent on individual mine costs, and inevitably ratification must result in some degree of protection for the uneconomic producer. In any event the issues involved are now so complex and so distorted by matters extraneous to purely economic considerations that there is a real need for an objective reappraisal of past history and of the content of the prospective Agreement. This requirement has been most competently met by Dr. J. A. Dunn, Chief Mineral Economist of the Australian Bureau of Mineral Resources, writing in the *Australian Mineral Industry, Quarterly Review, Volume 6, No. 3.* Although *The Mining Journal* does not necessarily identify itself with all the opinions and conclusions drawn by Dr. Dunn, we accordingly reproduce below extended extracts from his article.

The International Tin Agreement will come into force if nine consuming countries (out of 18 represented) holding one-third of the consuming countries' votes, and producing countries holding nine-tenths of producing countries' votes, deposit their instruments of ratification of acceptance.

The innate preference of almost all engaged in industry, and of those concerned with its administrative and political aspects, would undoubtedly be to leave industry entirely free in every legitimate direction—to let the so-called laws of supply and demand determine the flow of trade, untrammelled. That may be the preference, but it certainly has not been accepted as practicable in the complex organization of modern trade. Economic, ethical, social, legal, administrative and political difficulties arise at various points necessitating some assistance to industry—by tariffs, subsidies, bounties, production limitations, cartels, or agreements, which imply some form of direct or indirect control or pressure on one or other branch of industry. The pressure may be relieved at one point only to appear in greater or lesser amount at another—the value of the assistance is to be judged by whether the secondary pressure incurred is greater or less than the primary pressure which the assistance is designed to relieve.

TARIFFS CAN ONLY HELP THE PRODUCER

Tariff protection has been an integral part of trade for so long that many in industry overlook the adverse effect which the tariff privilege they enjoy may have on like industries in other countries, or on other industries in their own. They may not appreciate that that tariff is, in fact, a form of control at some point. Indeed, it is not uncommon to hear advocates of tariff protection expounding against "controls" in general.

Tariffs have received implied international sanction by such instruments as the General Agreement on Tariffs and Trade. As remarked above, they are of assistance in countries which are net importers. Countries which are net exporters of a commodity have no such means available to them as an aid to domestic producers of that commodity. They must fall back on some other means of assistance, such as subsidies and bounties, but if production of the particular commodity forms a large part of that country's trade these forms of assistance may be quite impracticable over any but a short term. Some may advocate that in such a case economic laws should be permitted to take their course, and marginal and submarginal producers be driven out of production. But, when this would jeopardize not only the livelihood of a large section of a country's population but also the national solvency of the country itself, some means must be found of providing that degree of aid which tariff protection has provided to importing countries.

From 1931 and until the war, the tin exporting countries found the answer to this problem in an International Tin Agreement, which was renewed from time to time. The Agreement was amongst producing countries, consumers took no part except insofar as in the later years representatives of two of the leading tin-consuming countries sat in on the Tin Council's discussions. Some have observed that the pre-war Agreement was essentially a cartel formed to maintain prices at a high level, but the facts dispel this fallacy.

The term "cartel" seems to have become surrounded with a popular aura of disrepute, probably because the consumer regards it as a conspiracy to prevent him getting his requirements at the minimum possible price. Particularly in the base metals this attitude follows naturally from the whole trend of marketing under which the economic welfare of the base metal producer is finally determined by the consumer through the bids for that metal which passes through the metal exchanges. This power of the consuming industries over producers has come down so long through history and is so pervading that it has become implicitly accepted as a basis of industry. Yet, it is fundamentally the very cause for tariffs and all the other kinds of assistance to producers. The cartel is one form of producer resistance to the power of the consuming industries—not uncommonly, by the rationalization which it requires, it may also be in the ultimate interest of the consuming industries.

As distinct from the pre-war producers' Tin Agreement the endeavour in post-war Agreements in general has been to make them more respectable by including in them both producers and consumers. Whether this is invariably a good thing is debatable, it naturally implies compromise which is not always good, and maybe no general view should be advanced but each proposal studied separately on its merits.

ADVANTAGES OF A QUOTA SCHEME—

The basic reason for a tin agreement is that existing tin-producing capacity throughout the world exceeds world consumption by over 30 per cent. To correct this the International Tin Agreement proposes to restrict net exports from producing countries to a quarterly quota, determined by the Tin Council, equating total production as closely as possible to demand.

Such an export quota scheme has the advantage that production is cut equitably amongst producing countries. In the absence of agreed orderly reduction the higher cost producers would be forced to close down—this would include practically the entire production of Bolivia (which country depends on tin for more than 60 per cent of its internal and external revenue), the bulk of that from Belgian Congo, and much of Chinese production from sluicing in the Far East, particularly Malaya. The financial stability of Bolivia would be destroyed, and that of some other countries jeopardized. Unemployment in producing countries would become serious and, in the Far East in particular, would add further to the difficult political hazards of that region.

By means of a quota scheme mines are kept open which might otherwise have closed, thus avoiding loss of part or the whole of their remaining reserves for all time. This conservation of world reserves is an aspect of such an Agreement on a mineral commodity which distinguishes it from Agreements on all other commodities.

The quota scheme maintains production plant capacity in being, which otherwise would not be available at short notice to increase output as demand requires. It thus increases rather than decreases the overall flexibility of the mining industry to meet variations in demand. This was particularly illustrated by the rapidity with which the tin mining industry, under the quota scheme of the pre-war Agreement, was able to expand production to meet demand before Japan entered the war, and the ability of Bolivia, Belgian Congo and Nigeria to expand output during the war. Thus, a quota scheme is also a form of guarantee to consumers against shortage.

—AND THE DISADVANTAGES

The quota scheme has the disadvantage that it places production restrictions on medium and low cost producers which they may otherwise not have felt. So far, all the important producing countries have strongly supported the scheme, and in even the lowest cost producing countries the majority of the

lower cost individual producers appears to have favoured the scheme—a few large low-cost individual producers have opposed it. The disadvantage has, therefore, been largely accepted by those on whom it will fall. The quota scheme cannot in any sense be said to impose a restriction on consumers as to the source from which they may procure supplies, for without the quota scheme the consumers' source of supplies would be reduced to those who can maintain output at the lower price which would prevail.

Of great importance is the level of prices written into the Agreement—a floor price of £stg.640, and a ceiling of £stg.880. The contention may be made by producers that these levels are too low, and by consumers that they are too high.

Producers point out that unless the level of prices takes into account the cost of a reasonable bulk of world production, the purpose of an Agreement—to maintain in being mines in such countries as Bolivia, Belgian Congo and Malaya—will be defeated. An unduly low price would also delete, in many cases permanently, a considerable portion of world reserves of tin.

Consumers point out that the level of prices should be based on the "laws of supply and demand," which to them suggests recent low prices, otherwise other forces, such as substitution of alternative commodities, will still further depress the demand.

HOW RIGHT ARE THE AGREEMENT PRICE LEVELS?

Judged on costs in producing countries in recent years, the prices proposed in the Agreement are not unreasonable. As with any other metal, considerable profit will be earned at any level of the proposed range by some particularly low cost producers. But production costs of a very considerable body of producers are well above the floor price, and many of them close to the mid-point £760.

Judged on market prices in general the proposed levels for tin bear favourable comparison with the pre-war range of tin prices when related to post-war inflation, and also to the present-day range of prices of other base metals. The proposed range between floor and ceiling, £240, is somewhat greater than may have been anticipated; it seems to have resulted from a compromise, but only time will demonstrate whether this will lead to a greater or lesser restraint on price fluctuations.

The division of the price range under the Agreement into three parts, in the mid-third of which the Buffer Stock may not act to restrain price fluctuations, could carry some critical implications noted later, but the division can be judged only by results in practice.

Consumers, in commenting that the floor prices so far written into the Agreement should have included recent low prices, have pointed out that these recent prices did not result in reduced production, even though some high cost producers closed down. But the fact is overlooked that much production in the latter part of 1953 was based on contracts on higher prices ruling before the recent collapse of tin prices; also, those producers who could do so worked higher grade ground and increased production in order to reduce costs.

Although consumers have suggested that high prices will encourage substitution of other materials for tin, it must be remembered that substitution of alternative commodities is a constant feature throughout industry, and price is not the only stimulus for it.

It has been asserted that by maintaining price levels, the pre-war Tin Agreement encouraged by unnecessary flow of capital to the tin industry, perpetuating the surplus production capacity, and the proposed post-war Agreement may have the same effect. However, such new capital as was attracted to the tin industry in the years 1931 to 1939 was overwhelmingly on what was at that time reasonably low-cost production. It helped to keep average costs down and to bring lower grade ground into reserves. Without it there may have been a serious shortage of tin before the war commenced. Two factors, differential currency devaluations and reduction in grade of tin ground available, have in certain instances converted relatively low into relatively high cost producers. Considerations of price must not neglect these factors. The very high capital costs of equipping tin properties to-day are in themselves a considerable deterrent to investment.

The Tin Agreement has been described as a price fixing instrument. There is no similarity between price fixation or price control, as we came to know it in the war and post-war years, and the decision in the Agreement by which prices will be restrained between reasonable limits. The Agreement does not fix prices, its object is to put a brake on the fantastic price fluctuations to which tin has been subject.

The Agreement contains within itself provisions for adjusting floor and ceiling prices as may be necessary, and it cannot therefore be rejected offhand on the initial price levels.

THE BUFFER STOCK

The Buffer Stock is the third important feature of the proposed Agreement. Its purpose is essentially twofold, as in the pre-war Agreement: to correct errors in the quarterly equating of export quotas to demand, and to prevent violent fluctuations in price by buying or selling tin on the London Metal Exchange according to whether the price of tin is in the lower or upper third respectively of the price range. Producing countries will contribute up to an equivalent of 25,000 tons of metal to the Buffer Stock, up to 75 per cent of which is to be in metal, the remainder in cash. The Buffer Stock must contain 10,000 tons before the quota scheme of exports is brought into operation.

The above three features represent the fundamental principles of the Agreement, which is, in the main, suited to the particular problems of the tin industry. Although the Agreement is designed for flexibility, it contains several features, some introduced in the process of compromise, which may give rise to difficulties in the practical working of the Agreement. Two of these could be critical: the method of voting and the relation of export quotas to price.

Important decisions of the Council, which will administer the Agreement, are made by majority votes of producer and consumer countries counted separately. Thus producer and consumer countries, each as a group, have the power to veto proposals of the other. The interests of the two groups may be particularly opposed in decisions on export quotas and price levels. If export quotas are not adjusted by the Council in such a way as to allow prices to rise to counter-balance times when the prices fall, and thus the Buffer Stock from its early stages is permitted only to buy and not to sell tin, the stage could soon be reached when the whole Agreement would become inoperative. In such a delicately balanced mechanism, the danger is made more real in consequence of the wide middle third range of £80 over which the Buffer Stock is to be generally inactive.

The Agreement cannot be condemned because of operational weaknesses; it contains within itself the means whereby any amendments may be made as may prove necesssary during the term of the Agreement. It is apparent that the success or otherwise of the Agreement could depend on the good sense of the Tin Council (consisting of representatives of participating countries) and its chairman, and not on the text of the Agreement itself.

Fundamentally, there are only two features of the Agreement which may disturb industry; the export quotas and the price levels. The export quotas will affect adversely only the low-cost producers in net exporting countries, but the majority of these seem to have accepted the burden. The level of prices is a matter of opinion on which unanimous agreement can never be expected; but all will admit that the initial compromise levels are preferable to the previous fantastic price levels experienced by tin.

The Agreement is essentially a producers' Agreement; notwithstanding the extent of their commitments in its text, a sufficient number of producing countries is likely to ratify it. Apart from a small contribution to administrative expenses, consumer countries have no commitments under the Agreement. Possibly many consumer countries may see in it little present advantage to them, and may not regard the long term advantages as requiring immediate attention. Accordingly, whether a sufficient number of consumer countries which attended the recent conference will ratify it by June 30, 1954, remains uncertain. If the support of consumer countries proves insufficient, there is nothing in the principles of the Agreement which would prevent it (with slight modifications) from being operated only by producer countries as before the war. Should producer countries be compelled by circumstances to follow this course, consumer countries may find a higher level of prices written into such an Agreement than at present. Producer countries, in contemplating a Tin Agreement without the participation of the principal consumer countries, would take into consideration the ethical risk of tin from strategic stockpiles re-entering world trade during the term of such an Agreement.

MACHINERY AND EQUIPMENT

Demonstration of Rock Drills

On February 12, 1954, a representative of *The Mining Journal* was present at the Acton works of Holman Bros. Ltd. when members of the technical press saw an interesting demonstration of the Holpack, Diamond Drill, Dryductor and Silver Three units.

The Silver Three and in foreground the Dryductor showing absence of dust

The Dryductor, last described in *The Mining Journal* of June 12, 1953, in connection with its use in roof bolting operations, is presented by the manufacturers as a practical solution to the problem of drilling without water while avoiding the loading of the atmosphere at the drilling face with fine particles of dust. The drill is built in the form of a Handril, weighs 60 lb. and has a stroke of 2¼ in. and a bore of 2¼ in.

The Holpack compressor unit, designed to include either the ATH8 or TA13 compressor, is driven through a universal coupling from the tractor power take-off shaft via a ball bearing mounted lay shaft, through a V-pulley drive to the compressor. The two alternative sizes of unit are each 3 ft. 10 in. long, 3 ft. 8 in. wide and 4 ft. 10 in. high (ATH8) and 4 ft. 11 in. (TA13). Piston stroke in each case is 4½ in. and maximum continuous air pressure 125 lb./sq. in. This unit was described in our issue of April 17, 1953.

The Diamond Drill is suitable for drilling to 500 ft. with standard bits and equipment, but larger diameter holes may be drilled to a shallower depth. Mounting is by standard rock drill saddle with a 5 in. cone and diameter of hole is 1½ in., diameter of core ⅞ in. The drill is 48 in. long, 11 in. high and 11 in. wide. Its bit speed grades from 800 to 3,000 r.p.m.

The Silver Three medium lightweight handril has been designed for use with the airleg, and combines high speed with lightness of blow. This unit has a bore of 3 in., a stroke of 1⅛ in., and weighs 53 lb. on dry drilling or 55 lb. on wet. Its overall length is 22⅞ in. with bar handle and 26½ in. with "D" handle, or 18¼ in. and 22⅞ in. respectively, less retainer. Rotation is 1/30, and either ⅞ in. or 1 in. hexagon shanks can be taken.

Portable Radioactive Ore Detector

Stated by the manufacturers to be convenient and simple in use, the latest Ekco portable radioactive ore detector, the Type N533, represents a new development in portable prospecting equipment. It is introduced by Ekco Electronics Ltd.

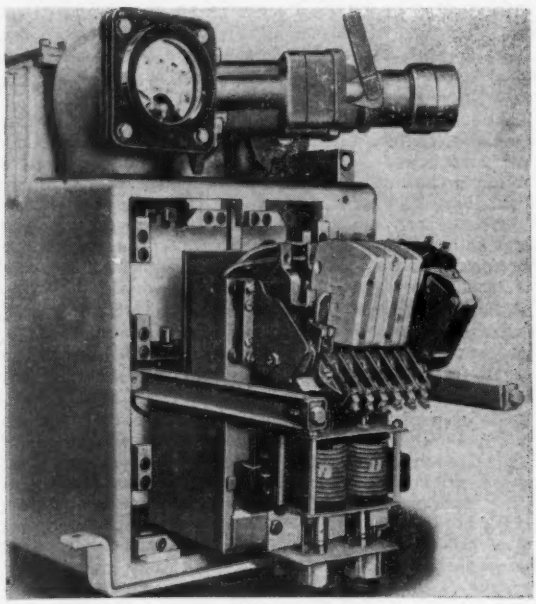
Incorporating a Geiger Muller tube, the unit has a miniature high-grain amplifier which, through headphones, gives a clear audible indication of the presence of radioactivity. Weighing 4¼ lb. and measuring 33½ in. long, the N533 can be carried in the hand or slung from the body on a shoulder strap.

Metropolitan-Vickers Mining Equipment in 1953

Among the equipments manufactured by Metropolitan-Vickers Electrical Co. Ltd. during 1953 were 31 electric winder units with combined output of 49,000 h.p. Nine equipments totalling 29,000 h.p. operate on the Ward-Leonard system of control, several being automatic winders fitted with bi-directional control using a biasing unit and long range cam gear. A further 22 equipments were supplied with the M-V transductor scheme of dynamic braking.

Notable among the manufacturers' electric winders was the 1,225 h.p. A.C. equipment at Lynemouth Colliery and the 450 h.p. automatic winder at Linton Colliery which at present is operating under manual control. A double drum sinking winder, the first in Britain to be electrically driven, was put into service at Rufford Colliery, while the two largest twin-motor A.C. drives in South Africa, each rated at 4,500 h.p., were commissioned at the Merriespruit and Virginia gold properties. The unit at Virginia was described in *The Mining Journal* of February 12, 1953.

A new 80-A flameproof mining contactor unit (gate-end box) has been introduced by the company. This unit, type MCU82, has been developed in accordance with the National Coal Board's Standard Specification No. P3/1950. In addition to the usual protective features associated with contactor type gate-end boxes, the MCU82 unit is provided with a new certified intrinsically-safe low-voltage pilot control circuit and an earth-leakage electrical lock-out circuit of the intrinsically safe type.



The mining contactor unit type MCU 82 with ammeter

Two 400 h.p. synchronous induction motors have been ordered for main ventilating fan drives at Westthorpe Colliery, and five 60 h.p. pump drive motors and seven slipring motors, ranging from 110 to 175 h.p. with control gear, have been ordered for Nigerian mines, while 37 squirrel cage motors have been ordered for a coal preparation plant in Australia. Electric trolley locomotives have been supplied to the N.C.B.

METALS, MINERALS AND ALLOYS

The trend of business in the United States continues to dominate market sentiment. Any upturn of American business is still to seek and buyers continue increasingly cautious with supplies more than adequate and unemployment rising. The Federal Reserve Board reports that industrial output fell in January for the third successive month. The current rate of production in the iron and steel industry, one of the leading barometers of trade, is reckoned at about 75 per cent capacity without prospect of any early improvement in the rate. President Eisenhower told a news conference last week that March would be the critical month in deciding which way the national economy was pointing in the months ahead. If the employment curve did not show improvement in March it would be a definite warning calling for a number of support measures. Republican political leaders are scared of the effect on the autumn elections should business continue to lag and unemployment rise; naturally, this prospect causes jubilation in the Democratic camp. The reluctance of the administration to admit the existence of "Recession" is reported to be causing considerable soreness amongst some of President Eisenhower's supporters.

Naturally, the repercussions of a movement to support industry officially may endanger President Eisenhower's budget scheme on which so much else depends. Mr. Edwin Nourse said recently he did not think there were adequate grounds for counting on a recovery in the second or even the third quarter of the year and recalled the view, so familiar after the 1929 collapse, that production had outrun the consuming power of the American people. Until a recovery in U.S. business sentiment is in sight, any sustained advance in metal prices can hardly be looked for.

COPPER.—Market wise there is little to report this week about copper in the U.S. The 29½-30 c. basis remains steady, with good export demand a steadying influence. Domestic sales in February are expected to be 80-85,000 tons against 71,000 for January.

Additional cutbacks in the domestic mine output are announced this week by Kennecott, resulting in two more of their mines in the South-West reverting to a five-day week, together with a lay-off of some 350 men. We have already pointed out in this column that the cutbacks in domestic production announced by the American copper companies are to some extent being offset by their new high cost mines which are now coming into production, with guaranteed floor prices at which output can be sold to the government in default of private buyers. This new high cost production will not, however, fully offset the cutbacks which have already been announced and it is beginning to look as if the companies with interests in Chile are paving the way for the eventual absorption of the accumulated Chilean stocks so as to upset price levels as little as possible. Meanwhile, a Bill has been introduced into the U.S. House of Representatives to continue the suspension of copper import tariffs for another two years—that is until June 30, 1956.

Mr. Louis MacKenna has stated in Santiago that the Bill providing for changes in taxation and exchange rates for copper producers has been completely revised. The Bill, called the Copper Statute, consolidates all fiscal taxes into a single tax of 75 per cent on profits. It also provides for the setting up of a state organization called the Copper Institute, to control sales of copper, headed by the Ministers of Finance, Economics and Mines, and including representatives of clerks, labourers, the companies and Congress. The Bill will be submitted to the Chilean Congress after the new session starts on March 2.

According to the U.S. Bureau of Mines consumption of refined in the U.S. last year was 1,464,575 s.tons compared with 1,479,732 s.tons in 1952. Consumption in the second half of the year showed a decrease of 23 per cent on the figure for the first six months, about the same reduction as in the U.K.

Japanese output of rolled copper products, principally brass, totalled 101,047 tonnes last year compared with 88,916 in 1952.

TIN.—It is reported from Brussels that M. André Dequae has been authorized by the Belgium and Colonial Council to contribute to the international tin buffer stock, assuming ratification of the International Tin Agreement. The Agreement is open for ratification for three months from next Monday and we publish on page 240 a considered view of the factors involved in the restriction.

In the U.S. last week, tin buyers from the various major steel mills held a closed meeting at which it is understood that the United States position in regard to the International Tin Agreement was on the agenda. Messrs. Nathan Trotter and Co. have raised the contention that if the U.S. Government supported tin prices through an international agreement it should do the same for lead and zinc and proclaim that it is a supporter of high prices. High prices would not increase the use of tin.

The R.F.C. is understood to have written to the Indonesian Government indicating a price basis for negotiating the remaining year of the tin purchase contract. The amount deliverable this year under the agreement is said to be 8,000 tons of concentrates but, of course, indecision on the closing of the Texas City smelter is one of the facts to be taken into consideration. Meanwhile, a rumour emanating from Amsterdam reports that Indonesia will ship 20,000 tons to the U.S. over a twelve month period, the price to be based on the mean average market price in New York for the 30 days following delivery in New York.

LEAD AND ZINC.—The House of Representatives has named a four-man committee to discuss with Doctor Gabriel Hauge, the White House economist, the difficulties of the domestic lead and zinc industry. Meanwhile, Senator Malone has introduced a Bill to encourage and assist the production of strategic and critical metals, minerals and materials in the United States. Both branches of Congress, the White House, the Tariff Commission and other interested Government bodies are thus trying to decide upon possible relief to domestic lead and zinc producers. (See also "Notes and Comments," page 231.)

The A.S. and R. cut the New York price of the metal by ½ c. last week to 12½ c. per lb., soon followed by other producers bringing the quotation down to about that ruling last April. The reasons are said to be increasing hesitancy on the part of U.S. consumers in face of the growing spread between London and New York prices. After the cut, trading improved.

The Bureau of Mines computes U.S. domestic mine output last year at 335,000 s.tons against 390,161 in 1952; the decline is attributed mainly to price declines, freight, handling, smelting and refining charges are estimated to have accounted for 3 c. to 5 c. of the market value.

There is little fresh news regarding zinc since our last issue. Despite last week's cut in the U.S. price to 9½ c., buying continues on a hand-to-mouth basis and seems likely to remain so until the cutbacks in domestic production begin to be felt in the market.

It is now reported that the four Western Senators who recently canvassed the position of the U.S. zinc mines with President Eisenhower did not discuss the issue of tariffs but were led to believe that steps to assure adequate stockpiles both of zinc and lead would receive early attention.

ASBESTOS.—The A.S. and R. and the United Asbestos Corporation are reported to be putting up some $20,000,000 to drain the Black Lake at Thetford and develop asbestos deposits believed to be the largest in the world.

TITANIUM.—Rem-Cru Titanium Inc. has announced a new price schedule with cuts up to 14 per cent in a number of its processed products: increased production and improved processing have made the reductions possible. It is the third cut which the company have made. Sponge is still quoted at $5 per lb.

GOLD.—The U.S. output showed some gain last year at 1,964,676 f.oz. compared with 1,886,036 f.oz. in 1952 and 1,957,543 f.oz. in 1951, according to the Bureau of Mines. Last year the Alaskan output surpassed that of California.

SILVER.—Unlike the gold industry production of silver in the U.S. last year showed a sizeable decline at 36,776,003 f.oz. compared with 39,100,923 f.oz. in 1952 and 39,463,661 in 1951. The decline was due principally to the closing of lead-zinc producing mines. Alaska yielded 39,111 f.oz., chiefly from bucket dredges in the Fairbanks and Nome districts.

WOLFRAM.—On Monday last the Ministry of Material's selling price was reduced by 25s. to 120s. per unit for tungsten, and 115s. for scheelite. We have heard of a certain amount of forward business taking place as low as 102s. 6d. but the market has been exhibiting a somewhat firmer tone and it may be that the shake out in prices is nearing completion.

Iron and Steel

Messages from Washington indicate that the U.S. Government has agreed to discuss with representatives of the European Coal Steel Pool "a possible American loan" to foster European integration and modernize equipment. Meanwhile, the attempts to bring the British steel industry into more intimate relationship with the High Authority seem to be making little progress.

In this connection the pronouncement of Sir Ellis Hunter, the chairman of Dorman Longs, and for eight years president of the British Iron and Steel Federation, is of considerable interest. "The European Coal and Steel Community," he says, "has been in existence for too short a space of time, and is working in too uncertain a manner to permit of any firm judgment on the likely effect of any British association with it." Sir Ellis further points out that in the long run, whether or not Britain does become an associate of the Community, the relations of the British steel industry with those of the Continent will inevitably be determined by relative costs in which Britain at present has "a real and considerable advantage."

Although the ten per cent rise in railway freight charges becomes operative on Monday next, the Iron and Steel Board has given no indication of its intentions in regard to the adjustment of the maximum home prices of iron and steel. Export prices, however, are being rapidly reduced to meet the more keenly competitive conditions which are developing in overseas markets.

Following a cut of £5 per ton in the export price of steel plates, a uniform price level has been established for home and export sales of British re-rolled steel products. This entails reductions in the basic price of angles from £35 to £31 14s. 6d. and for flats and rounds from £35 to £32 4s. 6d. per ton f.o.b.

This elimination of the export premium for re-rolled steel products is regarded as the first step in the more vigorous prosecution of the steel export drive. Home demand has been overtaken by the big upswing in production: raw material problems have been solved and it is confidently anticipated that outputs this year will make possible a reduction of imports and a further expansion of the export trade.

The London Metal Market

(From Our Metal Exchange Correspondent)

Prices throughout the week have shown a somewhat firmer tendency but the business has not been on a large scale. The tin picture presents many difficult problems, as in spite of the possibility of America's signing the International Tin Agreement becoming more and more remote, the price remains steady and the opinion is gaining ground that the prices in London will remain at, or above, the present level throughout the period the Agreement is open for signature. Consumer demand is reasonably good and no selling pressure has developed on the rising market. On Thursday morning the Eastern price was equivalent to £657⅛ per ton c.i.f. Europe.

London prices of lead and zinc are both up in spite of the decreases in the American prices for the two metals last week, and provided no large scale selling develops from the other side of the Atlantic the markets should hold steady. In the United States stocks of both metals are increasing despite cutbacks in production, and the agitation for increases in the duties continues, and it would not be surprising if these had some measure of success in spite of the Administration's policy of keeping trade as free as possible.

There has been more interest in forward copper recently, but the main activity still covers "prompts" falling due during March and early April. There has been no confirmation of the rumour that the Ministry will be withdrawing from the market at the end of March, but the impression is gaining ground that unless the market situation for cash copper becomes very desperate (which seems unlikely) this rumour will prove correct. In America the question of the suspension of the copper duty is once more before Congress, and some quarters expect that there will be a compromise and that the suspension will only be agreed to if the basis price at which the duty automatically operates is increased above the existing 24 c. per lb. level. The demand for copper remains good although most users complain of short order books, but the feeling is that this state of affairs is due more to distrust in the present price level than to lack of actual business, and that any fall in price will see a good demand develop.

Closing prices and turnovers are given in the following table:—

	February 18		February 25	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£670	£672½	£670	£672½
Three months	£643	£645	£645	£646
Settlement	£672½		£672½	
Week's turnover	515 tons		590 tons	
Lead				
Current month	£82	£82½	£81½	£81⅝
Three months	£81½	£81⅝	£81⅜	£81½
Week's turnover	3,125 tons		3,725 tons	
Zinc				
Current month	£71½	£71⅝	£71⅝	£72
Three months	£70½	£70½	£70½	£70⅝
Week's turnover	2,775 tons		2,350 tons	
Copper				
Cash	£235	£236	£232	£233
Three months	£217½	£218	£219½	£219½
Settlement	£236		£233	
Week's turnover	4,500 tons		5,325 tons	

OTHER LONDON PRICES — FEBRUARY 25

ANTIMONY

English (99%) delivered, 10 cwt. and over .. .. £210 per ton
Crude (70%) .. .. .. £200 per ton
Ore (60% basis) .. .. .. 22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) .. .. £483 per ton

OTHER METALS

Aluminium, 99·5% £156 per ton
Bismuth (min. 4 cwt. lots) 16s. lb.
Cadmium (Empire), 13s. lb.
Chromium, 6s. 5d./7s. 6d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.oz.
Iridium, £60 oz. nom.
Magnesium, 2s. 10½d. lb.
Manganese Metal (96%-98%) £225/£262
Osmiridium, £40 oz. nom.
Osmium, £65/£70 oz. nom.
Palladium, £7 15s./£8 10s. oz.
Platinum, £30/£33
Rhodium, £42 10s. oz.
Ruthenium, £25 oz.
Quicksilver, £64/£65 ex-warehouse
Selenium, 30s. 6d. nom. per lb.
Silver 73¾d. f.oz. spot and f'd.
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth .. .. 65% 8s. 6d. lb. c.i.f.
60% 8s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 5s. 6d. per ton c.i.f.
" " (concentrates) £14 5s. 6d. per ton c.i.f.
" " Refractory £13 17s. 6d. per ton c.i.f.
Baluchistan Metallurgical .. £15 19s. 6d. per ton c.i.f.
Magnesite, ground calcined .. £26 - £27 d/d
Magnesite, Raw .. .. .. £10 - £11 d/d
Molybdenite (85% basis) .. 102s. 4d.-103s. per unit c.i.f.
Wolfram (65%) .. .. .. World buying 102s. 6d. nom.
" " .. .. .. 120s. U.K. Selling
Scheelite (65%) .. .. .. World buying price nom.
" .. .. 115s. U.K. Selling
Tungsten Metal Powder (98% Min. W.) .. .. 13s. 8d. nom. per lb. (home)
Ferro-tungsten .. .. .. 10s. 8d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £35 13s. 9d. d/d per ton
Ferro-manganese, home .. .. £53 10s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46% - 48%) .. .. .. 7s. 11d. - 8s. 4d. per unit
Brass Wire .. .. 2s. 4⅛d. per lb. basis
Brass Tubes, solid drawn .. 1s. 8⅜d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Markets were again much quieter during the week but the undertone remained steady and there was some recovery in turnover towards the end of the period. This was occasioned by a spate of good reports.

A healthy check in Kaffir shares was easily absorbed and some good features developed later in the week. Finance houses recorded little change but interest was shown in Anglo Transvaal, Consolidated Goldfields and Johnnies. Vereeniging also improved with the better South African industrial outlook. Consolidated Mines Selection were unchanged following the maintained dividend and higher profits in 1953.

Among Rand mines, the main interest was in the older producers despite the higher trend in costs. Uranium shares mostly took a back seat. In some issues, notably Robinson Deep, Crown Mines, Sub Nigel and Consolidated Main Reef, sharp advances were recorded. The reasons were, firstly, the hope of more native labour and consequently a higher throughput and lower working costs, which factors have been the bugbear of many of the older mines since the war. Secondly, it is thought that in some cases blocks of ore, formerly bypassed as unpayable, although at fairly shallow depths, may prove workable at present prices and by modern methods. Thirdly, there are also indications that the power supply problem may be overcome before long. Optimistic reports from Johannesburg have suggested that some simplification or amelioration of taxation conditions may be forthcoming in the Southern African budget. Dominion Reefs steadied at around 34s. 6d. The existing uranium plans are for the treatment of slimes accumulated by past gold production and it remains to be seen whether or not mining of fresh ore will be undertaken.

There was less interest in the Orange Free State group as a whole, especially uranium producers, but continual rumours of rich underground developments ensure that the March quarterly reports will be eagerly awaited. President Brand were again well to the fore in this respect and President Steyn also improved. It is thought that the first gold will be poured on this latter mine about the middle of March. Rumour was also busy in Johannesburg with Freddies South, but there was little change in the price of the shares.

West Africans aroused no interest, but the anticipated cut in the Ashanti final dividend from 25 per cent to 20 per cent depressed the market.

Diamond shares were steady and firm. De Beers finished unchanged after dipping earlier. The Preferred finished higher following investment demand. Potgietersrust Platinums eased due to market disappointment with the Union Platinum dividend.

Coppers were rather dull but there were three brighter features. Chartered rose on buying of the shares. This was probably in recognition of the investment status of the company and yield considerations. Tanks improved on buying from Brussels. Esperanza were steady. The shares are being quoted ex rights as we go to press. There have been no recent shipments of ore due to bad weather conditions, but it is intended to resume these in March when cupreous pyrites will be sent to Germany. The company plans to improve jetty and loading facilities and to provide more lighters and tugs. This is necessary on account of higher output.

Eastern tin shares hardened following the unexpected increase in the Southern Kinta interim dividend.

Columbite producers, among Nigerian tins advanced sharply. A recent market circular, giving known details and prospects for the future production of the metal, caused a revival of interest. It is estimated that the United States stockpile requirements have by no means been fulfilled and that even when the current bonus price is dropped the demand should expand from other countries which need the mineral but cannot afford it at present day prices.

FINANCE	Price Feb. 24	+ or — on week
African & European	2 3/16	.....
Anglo American Corpn.	6¼	.....
Anglo-French	20/6	—3d
Anglo Transvaal Consol.	25/-	+1/3
Central Mining (£1 shrs.)	29/6	—3d
Consolidated Goldfields	49/4½	+4½d
Consol. Mines Selection	31/10½	.....
East Rand Consols	3/9	.....
General Mining	4	.....
H.E. Prop	38/9	.....
Henderson's Transvaal	8/3	.....
Johnnies	51/3	+1/-
Rand Mines	3 3/16	.....
Rand Selection	35/-	.....
Strathmore Consol.	36/3	.....
Union Corp. (2/6 units)	31/-	—9d
Vereeniging Estates	4 5/16 XD	+ 1/16
Writs	34/9	—3d
West Wits	39/4½	—7½d
RAND GOLD		
Blyvoors	34/-	.....
Brakpan	9/6	+1½d
City Deep	20/-	.....
Consol. Main Reef	19/4½	+1/10½
Crown	41/3	+1/3
Daggas	3⅜	+ 1/16
Doornfontein	25/9	—9d
Durban Deep	36/3	+7½d
E. Daggas	14/-	+9d
E. Geduld .. (4/- units)	26/3	+3d
E. Rand Props	2⅛	— 1/16
Geduld	3 3/16	.....
Govt. Areas	12/6	+1/-
Grootvlei	20/-	—3d
Libanon	9/9	—6d
Luipaards Vlei	25/-	.....
Marievale	18/1½	+4½d
Modderfontein East	13/9	.....
New Kleinfontein	15/7½	.....
New Pioneer	21/3	—3d
Randfontein	69/-	—9d
Robinson Deep	15/3	+3/-
Rose Deep	14/4½	+4½d
Simmer & Jack	4/6	+3d
S.A. Lands	22/6	+7½d
Springs	5/7½	+1½d
Stilfontein	27/6	—7½d
Sub Nigel	39/4½	+3/1½
Van Dyk	6/-	+7½d
Venterspost	13/6	—3d
Vlakfontein	15/6	.....
Vogelstruisbult	37/3	+3d
West Driefontein	5 5/16	— 1/16
W. Rand Consolidated	2⅛	+ 1/16
Western Reefs	2 3/16	.....

O.F.S.	Price Feb. 24	+ or — on week
Freddies	10/-	—3d
Freddies N.	11/9	.....
Freddies S.	10/-	+1½d
F. S. Geduld	4 1/16	— 1/16
Geoffries	16/-	—6d
Harmony	31/4½	—4½d
Loraine	13/-	—6d
Lydenburg Estates	18/9	+9d
Merriespruit	11/6	—7½d
Middle Wits	17/-	—3d
Ofsits	2 3/16	.....
President Brand	53/-	+1/3
President Steyn	35/3	+6d
St. Helena	19/9	.....
Virginia Ord.	14/10½	+7½d
Welkom	18/3	—6d
Western Holdings	4¼	+ 1/16
WEST AFRICAN GOLD		
Amalgamated Banket	1/7½	.....
Arision	5/4½	.....
Ashanti	18/3	—1/3
Bibiani	4/3	—1½d
Bremang	2/1½	.....
G.C. Main Reef	3/4½	.....
G.C. Selection Trust	6/1½	—1½d
Konongo	2/4½	+1½d
Lyndhurst Deep	1/-	.....
Marlu	1/6	.....
Taquah & Abosso	2/4½	.....
AUSTRALIAN GOLD		
Boulder Perseverance	3/-	.....
Gold Mines of Kalgoorlie	13/6	.....
Great Boulder Prop.	8/6	.....
Lake View and Star	13/-	—3d
Mount Morgan	19/-	—6d
North Kalgurli	6/6	—3d
Sons of Gwalia	5/7½	+1½d
South Kalgurli	6/9	.....
Western Mining	11/10½	+1½d
MISCELLANEOUS GOLD		
Cam and Motor	9/3	.....
Champion Reef	4/7½	.....
Falcon Mines	7/6	—3d
Globe & Phoenix	23/-	.....
G.F. Rhodesian	5/9	—1½d
London & Rhodesian	4/6	—1½d
Motapa	2/3	—3d
Mysore	4/7½	.....
Nundydroog	5/7½	.....
Ooregum	3/6	+1½d
Oroville	16/9	+3d

MISCELLANEOUS GOLD (contd.)	Price Feb. 24	+ or — on week
St. John d'El Rey	19/6	+1½d
Zams	32/6	+6d
DIAMONDS & PLATINUM		
Anglo American Inv.	4 3/16	+ 1/16
Casts	23/3	.....
Cons. Diam. of S.W.A.	4⅛	.....
De Beers Defd. Bearer	79/3	.....
De Beers Pfd. Bearer	16¼	+ ¼
Pots Platinum	9/-	—3d
Watervaal	14/3	.....
COPPER		
Chartered	64/6	+10½d
Esperanza	6/9	+6d
Indian Copper	4/6	.....
Messina	3½	.....
Nchanga	6 5/16	— 1/16
Rhod. Anglo-American	49/3	—6d
Rhod. Katanga	13/6	—10½d
Rhodesian Selection	14/3	—4½d
Rhokana	18½	.....
Rio Tinto	20	.....
Roan Antelope	14/6	—1½d
Selection Trust	36/9	—6d
Tanks	63/3	+2/3
Tharsis Sulphur Br.	51/3	.....
TIN (Eastern)		
Ayer Hitam	24/9	+3d
Gopeng	7/3	+1½d
Hongkong	6/3	.....
Ipoh	15/3	.....
Kamunting	8/3	+3d
Kepong Dredging	4/3	.....
Kinta Tin Mines	10/3	.....
Malayan Dredging	24/9	—3d
Pahang	11/10½	.....
Pengkalen	7/6	.....
Petaling	7/9	.....
Rambutan	12/6	+3d
Siamese Tin	7/10½	+1½d
Southern Kinta	13/9	+9d
S. Malayan	23/-	+3d
S. Tronoh	7/6	.....
Sungei Kinta	9/4½	—1½d
Tekka Taiping	5/6	.....
Tronoh	21/6	.....
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	14/3	+1/10½
Beralt Tin	19/9	—3d
Bisichi	5/3	+6d
British Tin Inv.	13/3	.....
Ex-Lands Nigeria	2/7½	.....

TIN (Nigerian and Miscellaneous) contd.	Price Feb. 24	+ or — on week
Geevor Tin	10/3	+3d
Gold & Base Metal	3/3	+3d
Jantar Nigeria	8/4½	+6d
Jos Tin Area	12/10½	+1½d
Kaduna Prospectors	2/1½	.....
Kaduna Syndicate	2/1½	.....
London Tin	5/6	.....
United Tin	3/4½	+3d
SILVER, LEAD, ZINC		
Broken Hill South	2 1/16	+ 1/16
Burma Mines	2/-	+1½d
Consol. Zinc	27/-	.....
Lake George	6/-	—3d
Mount Isa	32/-	.....
New Broken Hill	22/-	—6d
North Broken Hill	2 1/16	— 1/16
Rhodesian Broken Hill	9/4½	—3d
San Francisco Mines	16/6	+6d
Uruwira	3/9	+7½d
MISCELLANEOUS BASE METALS & COAL		
Amal. Collieries of S.A.	42/-	.....
Associated Manganese	46/6	—1/6
Cape Asbestos	24/-	—4½d
C.P. Manganese	53/1½	—1/10½
Consol. Murchison	37/3	+1/3
Mashaba	3d	.....
Natal Navigation	2 3/16	.....
Rhod. Monteleo	1/9	+3d
Turner & Newall	72/6	+3d
Wankie	13/3	—4½d
Witbank Colliery	3 1/16	.....
CANADIAN MINES		
Dome	$29½	.....
Hollinger	$26½	+½
Hudson Bay Mining	$74	—1
International Nickel	$68½	—1½
Mining Corpn. of Canada	£4	.....
Noranda	$114	—2
Quemont	£5⅛	.....
Yukon	3/10½	.....
OIL		
Anglo-Iranian	9⅜	+⅛
Apex	44/4½	.....
Attock	37/6	.....
Burmah	66/10½	+3/1½
Canadian Eagle	30/-	+1½d
Mexican Eagle	19/7½	.....
Shell (bearer)	5⅛	+ 1/16
Trinidad Leasehold	20/-	+3d
T.P.D.	25/6	—3d
Ultramar	28/3	—7½d

COMPANY NEWS AND VIEWS

Recent Activities of Some Australian Mining Companies

Notes on the recent activities of some of the Australian gold, copper, and tin producers have lately been received from our Australian correspondent, which are appended below.

Uranium Mines and Norseman G.M.

Directors of Uranium Mines N.L. and Norseman Gold Mines N.L. have stated that uranium has been found in Western Australia at the Dundas Goldfield, and that two companies have agreed to co-operate in the exploration of the field. It is stated that there are two prospects of note; an extensive area of brecciated granite in which two trenches 40 ft. apart, disclosed yellow uranium mineral, with possibility of a much wider extension; the second is near the western shore of Dundas Lake, where radio-activity is said to be present over a number of miles, which appears to include some part of the crust of the lake. Uranium has yet to be found in the second prospect, but drilling is now in progress. The commercial value of the discoveries is as yet problematical.

New Coolgardie G.M.

New Coolgardie Gold Mines, Western Australia, has reported good assay values in its Barbara mine, at Coolgardie, and the Callion mine, 60 miles to the north. The east drive on the North lode at No. 5 level in the Barbara mine, started on a shear, was advanced 22 ft. in ore of an average grade of 23 dwt. over 43 in.; a winze has been sunk 142 ft. below the level, in ore averaging 27.7 dwt. over 36 in. to 95 ft. with low values below. The main shaft has now reached a depth of 949 ft. The main shaft on the Callion mine has now reached a depth of 562 ft. Winzing below No. 3 level had reached 169 ft., the last 29 ft. in ore worth 26.1 dwt. over 46 in. On No. 4 level the south drive was out 135 ft., 78 ft. showing values of 16.1 dwt. over 54 in. A west crosscut disclosed ore worth 39.3 dwt. over 5 ft. with 17 ft. of low grade lode, in which the highest assay value was 4.6 dwt. for 5 ft. Driving from this crosscut was in ore worth 12.9 dwt. over 67 in. The New Coolgardie mines are in a satisfactory position, and the developments in the Callion mine indicate that this property is a valuable addition to future prospects.

Norseman Gold Corporation

The interests of the large Western Mining Corporation organization are, generally, in an encouraging position. Norseman Gold Corporation in the last month, milled ore for a recovery of 9.4 dwt. gold per ton; development work off the Regent shaft, at No. 29 level, gave 8.7 dwt. over 50 in. for 95 ft. of driving; at No. 34 level, driving had reached the reef, and 20 ft. on lode had averaged 4.9 dwt. over a width of 48 in. In the Royal Shaft area, in the Princess Royal workings, sinking of the shaft had reached a depth of 1,147 ft.; winzing from No. 7 level was advanced 35 ft. in ore averaging 31.7 dwt. over 48 in. This mine is proving a rich section and its contribution to the mill is being well supported by stoping values from the Regent workings.

Gold Mines of Kalgoorlie

Gold Mines of Kalgoorlie continues at a satisfactory rate of development, opening up ore of normal grade. Recovered grade is 5.75 dwt. per ton, from a tonnage of about 15,000 tons per month. New Coolgardie Gold Mines, as already stated, are showing good development values, and the average recovery on 5,500 tons of ore per month, is 9 dwt. per ton. Great Western Consolidated, however, continues in ore of low average grade, the last return giving an average of 2.44 dwt. from 29,546 tons, the previous month's average being almost 2.5 dwt. from 33,040 tons. Prospects are indefinite, but it is thought that an increase in the tonnage of underground ore, as stope preparation advances, will help the position by displacing open cut ore, which has not been of the grade expected. The company has other leases in the group, containing higher grade ore, and it is believed that one, or more, is to be prepared for production.

The Mount Morgan Company

The Mount Morgan Company has announced its intention to redeem its preference shares. In the past 28 weeks the mine has produced copper to the value of £A2,715,000 on the present Australian value, which is an increase of approximately £A1,465,000 on the value for the same period last year. Production was 8,227 tons of copper, production in the previous corresponding period being 3,618 tons. There was also an increase in gold production, the quantity being 42,664 oz., compared with 37,258 oz. The last report for the four weekly period, which included the Christmas holiday period, shows a decrease in tonnage of ore treated by the sulphide mills of 4,250 tons; average gold assay also decreased from 4 to 3.24 dwt., and gold produced was 5,018 oz., compared with 7,056 oz. in the previous four weeks. Copper assay fell from 1.15 per cent to 1.03 per cent. The company is proceeding with the stripping of overburden on the Sugarloaf ore body, and has plans for diamond drilling other anticlines in the district.

Tableland Tin Dredging

Tableland Tin Dredging N.L. was the largest producer of tin in Australia while working the Return Creek area in North Queensland. With the exhaustion of ground of economic value, in the face of rising costs, the dredge was closed down, dismantled and removed to new ground at Smith's Creek, 12 miles away. The dismantling, removal and re-erection took 16 months and dredging has been resumed on the new area. The first month's work, covering necessary trials and adjustments, produced 49 tons 17 cwt. of tin oxide from 200,901 cu. yd. of ground, a yardage which was below normal, but good in the circumstances. It is expected to produce from 50 to 60 tons of concentrate monthly.

"Indians" in January

The January mine returns from the three Kolar Gold Field producers together with the ounces yielded from cleaning-up operations undertaken by Ooregum, contained the encouraging announcement from Champion Reef of the highest tonnage throughput for over two years and a gold production figure that has not been equalled since October, 1952. This indicates, perhaps, that it is now making better use of ore from the old Ooregum workings.

Company	January, 1954		Months since year end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Champion Reef ..	14	5,845	1	14	5,845	10	3,791
Mysore	15	6,174	1	15	6,174	16	6,252
Nundydroog*	19	5,743	1	19	5,743	21	5,985
Ooregum†	—	114	1	—	114	11	2,388

* Includes tailings. † Yield from clean up only.

West Africans in January

The January mine returns of the ten West African gold producers revealed the usual batch of mixed results.

Gold Coast Main Reef announced another good monthly return and the cumulative totals to-date show that the company has been sending a higher grade of ore to the mill. Konongo continues to crush a grade of ore higher than 20 dwt. per ton and working profits to-date disclose an improvement by some £11,000 over those announced in the corresponding period of the previous year.

Marlu looks interesting and with the cumulative working profit, some £20,000 greater than in the corresponding period of the preceding year, the possibilities of this company returning to the dividend list appear bright. Marlu's last dividend distribution was 10 per cent paid in respect of the year ended September 30, 1951.

Bremang has not begun the year too well although with only two of its fleet of four dredges in operation, a greater loss might have been expected. The company's No. 1 dredge was closed down on December 7 last for dismantling prior to its reconstruction on the Offin River area and its No. 2 dredge has been out of action while it, too, was in the process of being re-erected to work on the Offin River area. In fact, however, this dredge commenced operations in this area on January 30, so that the February monthly return should show a big improvement on the January results.

The cumulative figures to-date for Taquah and Abosso are interesting as they show that, although the tonnage milled and ounces recovered compare unfavourably with those recorded in the same 10 month period a year ago, the cumulative figure to-date stands at £97,000 against a loss of approximately £27,000.

Ashanti, while announcing a higher tonnage throughput and gold output, has a considerably reduced working profit compared with the preceding year due largely to the fall in premium revenue and higher working costs. Bibiani on the other hand, seems to be milling a much improved grade of ore but its working profits have declined by nearly 50 per cent compared with the profits achieved in the corresponding four month period in the preceding year.

Both these companies have just announced their final dividend payments in respect of the year ended 1953. Ashanti is paying 9s. 6d. per 4s. stock unit, or 20 per cent, making, with the 20 per cent interim already paid, 40 per cent for the year, which compares with 50 per cent paid as to an interim and a final of 25 per cent each in the preceding year. Bibiani announced a payment of 2s. 4d. per 4s. stock unit or 5 per cent, making, with the 5 per cent interim already paid, a total of 10 per cent for the year which compares with 17½ per cent paid as to a 7½ per cent interim and a 10 per cent final in the preceding year.

Company	January, 1954 Tons ('000)	Yield (oz.)	Profit (£000)	Months since year end	Current Financial Year Total to date Tons ('000)	Yield (oz.)	Profit (£000)	Last Financial Year Total to date Tons ('000)	Yield (oz.)	Profit (£000)
A.B.A.	66	10,506	9.8	4	266	42,885	62.4	235	36,893	85.9
Ariston Gold	30	9,865	39.9	4	123	39,488	164.1	119	40,936	207.4
Ashanti	24	15,446	58.2	4	96	61,179	247.2	89	59,500	306.9
Bibiani (1927)	30	6,300	4.4	4	93	25,255	24.6	122	24,144	47.0
Bremang*	332	1,393	L 3.4	1	332	1,393	L 3.4	596	2,736	5.4
G.C.M.R.	8	3,651	10.0	7	53	25,468	74.2	60	22,920	72.0
Konongo	2	2,700	13.6	4	10	10,424	51.3	9	8,885	40.7
Lyndhurst Deep	1	1,185	5.2	4	3	4,838	23.1	4	4,283	21.3
Marlu Gold	41	4,210	16.4	4	159	16,654	66.9	164	16,031	46.2
Taquah & Abosso	26	6,157	6.5	10	252	50,765	97.0	223	52,281	L 26.8

Profit figures include premium revenue. L Denotes loss.
* Dredged in cu. yds.

Coal Producers' Mixed Results in December

Witbank Colliery announced record production figures for the month of December as did two of the younger producers, New Largo, which commenced production in January, 1953, and Vierfontein, which started up in May, 1953. Witbank's total output for the year is well ahead of that achieved a year ago but the prize in this respect goes to New Clydesdale whose above average December output raised its mean monthly average production to over 62,000 tons compared with an average of around 38,000 tons per month in 1952.

The December figures announced for Amalgamated Collieries of South Africa—the lowest since July, 1951—was due to two of the collieries in the group, Largo and Springfield, ceasing operations at the end of November. Van Dyks Drift announced the best result since last April and its year end total shows up to advantage by some 14,000 tons compared with 1952. In our January 8 issue when we published the November returns a clerical error gave this company an 11 months cumulative total of 906,261 tons, this figure should have been 518,216 tons.

Wankie's monthly coal production was again below the 200,000 ton mark and its coke output was the lowest for any one month, including February, this year. However, the cumulative totals for the year for both coal and coke show an improvement over 1952 and it is expected that 1954 will see a steady expansion in Wankie's output.

COAL - DECEMBER

Company	December 1953	Months Since Year End	Cumulative Totals This year to date	Last year to date
Amal. Coll. of S.A.*	547,096	12	7,409,471	7,864,138
Apex	83,636	12	959,225	991,547
Blesbok	48,384	12	619,302	569,142
Coronation	91,075	12	1,068,355	1,097,549
Dundee	39,035	12	438,605	467,631
Natal Navigation	110,962	12	1,354,626	1,447,876
New Clydesdale	75,137	12	745,168	395,823
New Largo	69,582	12	587,587	—
S.A. Coal Estates	140,271	12	1,670,904	1,641,706
Springbok	69,086	12	856,941	849,547
Transvaal-Delagoa Bay	130,251	4	501,747	—
Tweefontein	108,026	12	1,279,529	1,318,085
Van Dyks Drift	56,215	12	574,476	560,039
Vierfontein	60,254	12	345,431	—
Vryheid Cor.	43,919	12	512,783	425,324
Vryheid Cor.†	35,298	12	432,541	289,672
Wankie Colliery	198,345	12	2,496,738	2,461,255
Wankie Colliery†	11,297	12	150,412	122,175
Witbank	153,801	12	1,623,864	1,459,018

* Largo and Springfield Collieries in this group ceased operations on November 30, 1953
† Coke

Company Shorts

Consolidated Mines Selection Maintain Payment at 25 Per Cent.—Consolidated Mines Selection in a preliminary profit statement giving the results for the year ended December 31, 1953, have announced the recommendation of a dividend of 1s. 6d. plus a bonus of 1s. making a total distribution of 2s. 6d. per 10s. unit on the £900,000 issued capital. The 25 per cent distribution is the same as was paid in 1952.

Year to Dec. 31	Working Profit £	Taxation* £	Net Profit £	Dividend† £	To Reserve £	Carry Forward £
1953	258,729	95,031	163,698	133,750	20,787	+9,161
1952	253,843	103,896	149,947	128,125	21,935	−113

* After deducting adjustments of £25,236 (1952 - £41) in respect of previous years.
† Proposed distribution and directors' additional remuneration thereon.

A sum of £4,213 representing appreciation of investments has been credited to general reserve, which now stands at £250,000 compared with £225,000.

Warrants for the distribution will be posted on or about March 30 to all those registered on March 1, 1954. It is proposed to issue the directors' report and accounts on or about March 8 and to hold the annual meeting on March 30. Mr. A. C. Wilson is chairman.

Months Ahead Critical for Alpine Barberton.—During the year to June 30, 1953, Alpine (Barberton) Gold Mine did not fall far short of fulfilling the modest hopes expressed by the chairman Mr. A. H. M. Wedderburn a year ago. Gold recovery rose from 7,140 to 7,915 f.oz., the average grade from 4.1 to 5.5 dwt. per ton and the net value of gold recovered increased by £7,285 to £99,447 while working costs, excluding development, fell by £6,067 to £85,388, giving a working surplus of over £14,000 out of which, however, £11,944 (£4,270) was expended on the increased development programme. After taking this and all other expenditure and depreciation into account the overall loss for the year was £4,383.

During the current year the company has experienced great difficulties. In mid-September every available stope face ran out of payable values with the result that crippling losses were incurred in October and November bringing the company, the chairman stated, nearly to the end of its resources. Present indications are of further improvement but the future of the undertaking, he added, is dependent on this improvement both in gold recovery and in development results being, in fact, achieved and maintained.

Dr. Braun Exercises His Options in Dominion Reefs.—Dominion Reefs (Klerksdorp) have announced that the first and second options, each in respect of 320,000 ordinary shares of 5s. each at par, granted to Dr. M. F. Braun under the agreement of March 3, 1953, have been exercised in full.

N. Charterland Exploration Sells Goodwood Ranch.—The North Charterland Exploration Company (1937), which is incorporated in Southern Rhodesia, has issued a circular to shareholders in which it is stated that the company is taking steps to develop and extend the profitable transport business of its wholly owned subsidiary, the North Charterland Transport Company (Nyasaland), which has been showing excellent operating results in recent years.

To carry out this policy, the parent company is proposing to sell the Goodwood Ranch to provide the necessary funds and an extraordinary meeting will be held in Salisbury, Southern Rhodesia, on March 31, to obtain shareholders' consent.

Seremban Makes a Small Profit.—Seremban Ltd. reported a gross profit of £182 for the year ended June 30, 1953. However a liability for U.K. income tax of £96 was provided and thus the debit balance carried forward was reduced by £86 to £1,403.

MINING ENGINEER required by Gold Dredging Company in British Guiana. Qualifications A.R.S.M., A.C.S.M., or equivalent. Experience of alluvial mining, particularly dredging, required. Salary £750 to £1,250 p.a., depending upon qualifications and experience, plus overseas allowance £250, marriage allowance £100. Free furnished quarters provided. Two years' tour with four months' leave and free passages. Apply in writing to Personnel Colonial Development Corporation, 33 Hill Street, London, W.1, stating age, qualifications and experience, quoting serial number 196.

GOLD COAST MAIN REEF

The twentieth annual general meeting of Gold Coast Main Reef, Ltd., was held on February 24 in London.

Major General W. W. Richards, C.B., C.B.E., M.C., chairman of the company, presided and the following is an extract from his statement circulated with the report and accounts:—

The profit for the year ended June 30, 1953, was £81,622. Dividends aggregating 7½ per cent were distributed for the year and an interim payment of 5 per cent has been made in respect of the current year ending June 30, 1954.

Full details of the year's operations are contained in the reports from our general manager, Mr. Frank Clelland, and our consulting engineers, West African Gold Corporation, Ltd.

Some features of interest are:—

(a) Bondaye—On the 14th level, the faulted section of the Main Reef orebody was fully exposed—length of reef 365 feet, value 11.03 dwts per ton, width 43.4 inches. On the 15th level, the same faulted section was fully exposed during the year and gave—length of reef 300 feet, value 11.08 dwts per ton, width 41.1 inches.

(b) Tuappim—On the 13th level, the main and south extension ore-bodies were exposed during the year over a continuous length of 495 feet, averaging in value 8.34 dwts per ton over a width of 66.1 inches. The internal shaft was sunk a further 116 feet, and driving towards the reef on the 14th level has since commenced.

(c) Ekotokroo—The drive towards the Ekotokroo section from the 16th level in the Bondaye section is expected to be under the north-east and Ekotokroo ore-bodies by June, 1954. The drive advanced 240 feet towards this objective during the year under review, and further progress has since been made.

The ore reserves at June 30, 1953 (including ore in pillars), were computed at 398,918 tons, averaging 8.64 dwts per ton over a width of 66.4 inches. Ore added to reserve during the year was less by 6,152 tons than the total extracted.

While looking forward with confidence to a continuance of profitable operations for many years to come, we are by no means complacent; and measures have been planned with a view to increasing the productivity of the mine.

The report and accounts were adopted.

The Chairman announced that the Second Interim Dividend for the current year and a First Interim Dividend in respect of the next year will be declared in the Autumn.

ASHANTI GOLDFIELDS CORPORATION LIMITED

NOTICE IS HEREBY GIVEN that the Board of Directors have to-day recommended a Final Dividend (No. 115) on the Issued Capital of the Corporation at the rate of 9.6d. per Unit of Stock, less Income Tax at 9s. in the £. This Dividend which is in respect of the year ended September 30, 1953, to be payable on and after May 6, 1954, to all Stockholders on the Registers on March 10, 1954.

The Transfer Books will be closed from March 11, 1954, to March 17, 1954, both dates inclusive, for the preparation of Dividend Lists.

By Order of the Board,

E. W. MORGAN, *Secretary.*

Registered Address:
10 Old Jewry, London, E.C.2.

February 23, 1954.

BIBIANI (1927) LIMITED

NOTICE IS HEREBY GIVEN that the Board of Directors have to-day recommended a Final Dividend (No. 33) on the Issued Capital of the Company at the rate of 2.4d. per Unit of Stock, less Income Tax at 9s. in the £. This Dividend which is in respect of the year ended September 30, 1953, to be payable on and after May 6, 1954, to all Stockholders on the Registers on March 10, 1954.

The Transfer Books will be closed from March 11, 1954, to March 17, 1954, both dates inclusive, for the preparation of Dividend Lists.

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EXCELLENT RECOVERY FROM 1952 DEPRESSION

The 33rd ordinary general meeting of Barrow Hepburn & Gale, Ltd., will be held on March 19 in London.

The following is an extract from the statement of the Chairman and Managing Director, **Mr. George W. Odey, C.B.E., M.P.,** circulated with the report and accounts.

The results for 1953 reveal a very satisfactory recovery from the slump conditions which prevailed during the previous year. There has been no further heavy depreciation in the value of stocks of hides and leather which necessitated the call on our stock valuation reserve in 1952. On the contrary, there has, if anything, been an increase in leather values during the year.

Trading conditions in the tanning industry have continued to be difficult. The improvement in the results of our group as a whole has been due primarily to the fact that we have had no heavy writing-down of stocks on the leather side of our business, and our activities other than tanning have continued to make steady progress.

Our main difficulties have again arisen in our heavy leather tanneries where the high price of domestic hides proved a severe handicap in the first half of the year. As a result, all our heavy leather tanneries were faced with a deficit at the end of the half-year. In the second half of the year I am glad to be able to report that there has been a considerable improvement.

LEATHER'S SUPERIOR QUALITIES

The problem of the use of leather is essentially one of price. The very high prices to which leather was forced owing to the price of the raw material during the Korean crisis did much to stimulate the use of substitutes. Now that leather is down to a reasonable and stable basis there is every indication that public demand will tend to favour leather with its superior comfort and health-giving qualities.

Leaving aside the somewhat special considerations of price, the general volume of trade—particularly during the second half of the year—has been good. The turnover of our group has shown marked improvement, and this particularly applies to our tanning and leather merchandising activities.

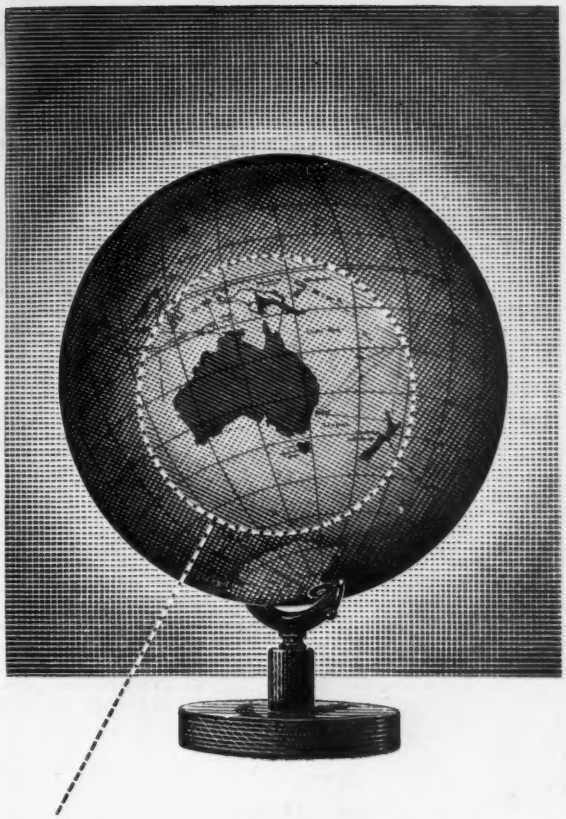
TRADING RESULTS

From the total net profit of £482,680 we have to provide for taxation to the extent of £263,716, leaving us with a net balance for the year, after adjusting minority interests share of profits of £218,281. After adding the balance brought forward from the previous year of £301,712 we are left with the sum of £519,993 available for disposal. Your Board thought it was prudent to devote £50,000 of this amount to increasing our stock valuation reserve which, including the stock reserve derived from the Leather Charges Order, now stands, after providing for income tax, at a total of £404,414. After providing for this item, the additional depreciation on fixed assets, the £50,000 taken to capital reserve by The Hodgson Extract Company (Pty.) Ltd., and the dividends, we are left with a slightly increased carry forward of £303,466.

THE OUTLOOK

Our travel goods and military equipment department, our transmission and conveyor-belting section, and our entire South African investment are all making excellent progress. Our leather-merchandising activities have expanded greatly, and if we can secure more favourable trading conditions in the tanning industry we should be able to improve upon the quite excellent results that we have been able to achieve in the year under review.

Nevertheless, as far as the tanning trade is concerned, we have to recognize that there is, at the present time, subsidization in one form or another in leather production in almost every country of the Commonwealth, and under Imperial Preference this leather comes into this country free of duty at prices with which it is well nigh impossible to compete. Furthermore, the fact that the United States—owing to its record domestic kill—has now an exportable surplus of hides, has tended to keep the American price of hides and leather on a very low level and is making it increasingly difficult for us to maintain our exports of leather to the dollar area. We are looking constantly towards the goal of securing the complete liberalization of trade in hides, skins and leather throughout the world. If we can achieve those conditions I am satisfied that the tanning industry of this country would again enter on a period of prosperity, but while the present conditions persist, the future must be viewed with caution.



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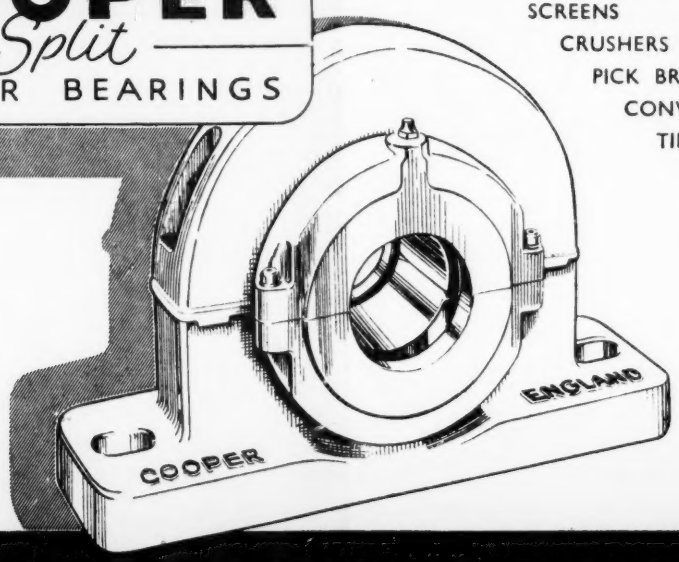

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